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Pacific Fisherman

ELECTRONICS IN FISHING

A SPECIAL REPORT

September 1959
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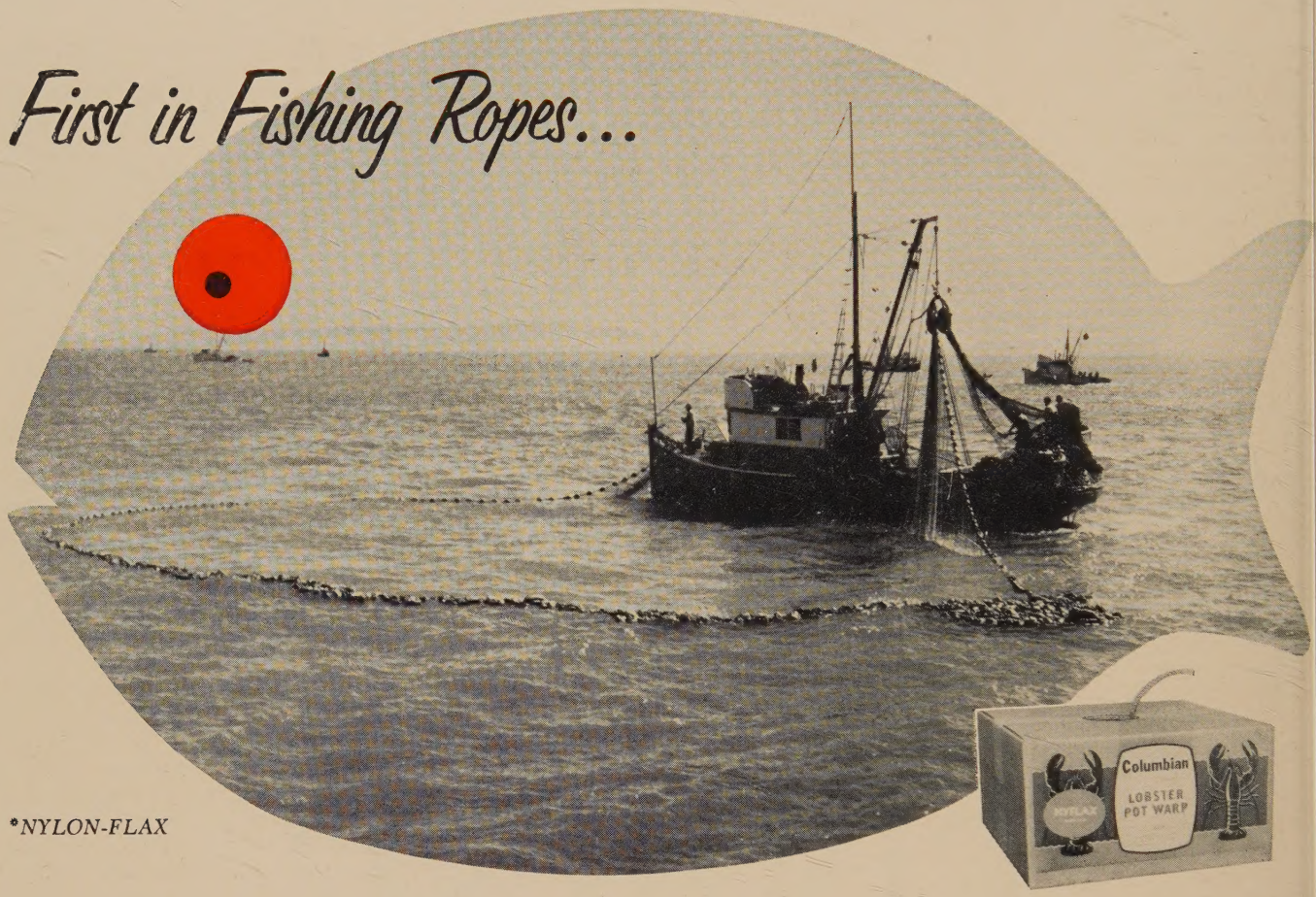

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PACIFIC FISHERMAN

Our Fifty-Seventh Year— **SEPTEMBER, 1959**
Vol. 57 **No. 10**

Table of Contents

Electronics in Fishing 11
Exploring the D.S.L. 13
Electronic Echo Ranging
By T. S. Gerhardsen 19
Radiophone Problems 51
Echo Fishing in Britain
By Cmdr. R. G. Haines 54
Electrical Trawl Cable 61

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London, W 1, England . . . . 130 Crawford St.

Cable—all offices—Milfreepub

PACIFIC FISHERMAN (with which is combined Pan-American Fisherman). Published monthly except January when publication is semi-monthly, by Miller Freeman Publications, at 731 S.W. Oak St., Portland 5, Ore. Entered as second class matter at the postoffice at Portland, Ore., under Act of March 3, 1879.

SUBSCRIPTION RATES: U. S., Canada, & Latin America, one year — $3, two years — $5, three years — $7. Other countries: one year — $4. Single copy 50c, except Yearbook Number, $1.

CHANGE OF ADDRESS—Send subscription orders and change of address to Subscription Department, PACIFIC FISHERMAN, 500 Howard St., San Francisco 5, Calif. Include both old and new addresses and zone number.

ADVERTISING: Complete plates only should be sent to PACIFIC FISHERMAN, 235 N. W. Park Ave., Portland 9, Ore. . . . Advertising copy and cuts, instructions and insertion orders should be sent to the Seattle office.

POSTMASTER:

Please send Notice 3579 to PACIFIC FISHERMAN, 500 Howard St., San Francisco 5, Calif.

A MILLER FREEMAN PUBLICATION

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Fraser Sockeye Run Sets Cycle Record Since 1903

● Surprising abundance of Sockeye salmon running to the Fraser this season set a new record *for this cycle* since 1903 before presstime of this issue, and was continuing.

The catch at presstime approximated 2,900,000 Sockeye, with about 1,705,000 taken by the Americans and 1,195,000 by the Canadian fleet. Fish were still being taken, although in declining volume. Deficit in the Canadian catch was due to the fishermen's strike early in the season.

In the 1955 cycle the catch *for the entire season* was 2,115,000 fish, with 1,108,000 taken by the Americans and 1,007,000 by the Canadians.

The gain in 1959 cannot be measured in catch alone, for the current escapement is expected greatly to exceed that of the cycle year. Thus the 1959 *run*—catch plus escapement—shows very large over-all increase above that of the parent year 1955.

● Pink salmon running to the Fraser and minor streams in international convention waters were expected to yield a catch comparable with that of the 1957 parent year; and at presstime was slightly ahead of that to even date in the cycle year.

However, the run was proving better than had been anticipated by scientists on the basis of water temperatures at the time of the 1958 seaward migration; and there were still possibilities that early September might produce above expectations. These presstime hopes were based primarily upon continuing catches of Pinks by trollers working at sea off Vancouver Island.

Remarkable number of Pinks taken by trollers was one of the two notable anomalies of the Pink run. The other was the apparent failure—to presstime at least—of the Pink run in Johnstone Strait.

Never before have the trollers taken as many Pinks as this year. Whether this was due to abundance or vagaries of the fish; or to greater and more effective effort on the part of the troll fishermen is a problem awaiting answer.

● To provide Pink salmon escapement adequate for rehabilitation of the runs of these species in Puget Sound streams outside international convention waters was one of the primary administrative problems of the Washington fisheries in 1959.

Degree of success attained was due largely to the voluntary action of the Nooksack, Swinomish and Tulalip Indian tribes, who entered into an agreement with Milo Moore, Washington director of fisheries, to observe on their reservations the special closures designed to provide escapement. This action was considered a vital contribution to conservation and rehabilitation of the runs.

A. W. Anderson on Commission

● A. W. Anderson, assistant director of the U.S. Bureau of Commercial Fisheries, in August was appointed by President Eisenhower a member of the International Pacific Halibut Commission. He succeeds Seton H. Thompson, now South Atlantic regional director of the Bureau.

Brenner Heads Oystermen

● Earl R. Brenner of the J. J. Brenner Oyster Co., Olympia, is the newly elected president of the Pacific Coast Oyster Growers Association, succeeding Edward J. Gruble. Stanley C. Gillies of South Bend was elected vice president at the late August convention in Seattle.

Charles R. Pollock of Seattle was re-elected secretary-treasurer.

Newly elected members of the board of trustees included: Mr. Gillies, R. H. Bailey, pioneer Oyster Co.; R. N. Steele, Rock Point Oyster Co.; and Lee J. Wiegardt, Wiegardt Bros.

Alaska Salmon Pack at Twentieth Century Low

• Presstime saw the dismal salmon season of 1959 in Alaska drawing to a close with no prospect of last-minute developments which would brighten the situation. Late August totals forecast the smallest aggregate production since the early years of the industry before 1900, under 1,750,000 cases to August 31.

Some consistent optimists saw the possibility of an up-turn in Pinks in southern Southeast Alaska, but the hope was dim.

Reds were virtually finished at about 575,000 cases. Pinks, with fewer than 607,000 cases, might not exceed 650,000 to the end. Summer Chums might not exceed 375,000 cases. Cohoes were half of last year. Only Kings were what you might call normal — and there volume is too small to be of significance.

• Estimates of the Japanese canned salmon pack of 1959, published in August by the Japanese fishery press, gave full-case figures as follows:

Variety	1959	1958
Red	500,000	666,000
Silver	80,000	193,000
Pink	1,250,000	924,000
Chum	300,000	375,000
Tidbit	50,000	55,000
Total	2,180,000	2,213,000

These figures show a strong rise in Pinks from earlier estimates, and it should be noted that the data are not offered as official figures. Decrease in canned Silvers is believed to result from increased freezing of this species for the British market.

U. S. S. R. Invites Fisheries Inspection Team From U. S.

• An American fisheries team, invited by the Soviet Union, currently is studying in Moscow and Kamchatka the fishery resources and industry of that nation.

This is a sudden and striking development of the late summer, balanced by an American invitation for a similar group to visit the United States and examine its fishing industry, methods, technology and science.

Included in the American team, beside an interpreter, are two biologists, an attorney-administrator, and a technologist.

They are: Clinton E. Atkinson, director of the Seattle Biological Laboratory, U. S. Bureau of Commercial fisheries; Clarence F. Pautzke, biologist and assistant director, Washington State Department of Fisheries; W. C. Arnold, managing director, Alaska Salmon Industry, Inc.; Charles Butler, coordinator, Saltonstall-Kennedy Program, Bureau of Commercial Fisheries, formerly chief, Branch of Technology.

The official release says: "The trio (referring to the first three named) will observe the fisheries — chiefly salmon—on the Pacific Coast of Siberia, and exchange with Russian scientists information on research activities of mutual interest to the two countries. Purpose of the trip to Russia is to create better understanding of mutual fisheries problems.

• Mr. Atkinson for several years has directed the researches of the Seattle Laboratory, a large part of which have to do with the studies of North American and Asian salmon in the high seas for the American Section of the International North Pacific Fisheries Commission.

For these researches Mr. Atkinson and his staff for years have sought samples of salmon taken from the streams of the Asian mainland; and thus of positively known origin. Endeavor to secure such samples would be expected to be a major objective of Mr. Atkinson in Kamchatka.

• American requests for permission for such a fisheries team to study the salmon resources and investigations of the Soviet Union are known to have been made from time to time over a period of years.

It is perhaps significant that the American team's visit to the Soviet Far East preceded only a few days by a similar inspection tour by a Japanese group. This party included: Dr. Hiroaki Aikawa, Kyushu University professor; Yoshimi Hirano, chief, resources investigation department, Hokkaido Regional Fisheries Research Laboratory; Tojiro Shinada, chief, North Ocean Fisheries Department, Nichiro Gyogyo K.K.; Jir Imai, investigation staff, Europe-Asi Bureau, Japan Foreign Office.

• Well-informed individuals close t the American fisheries were incline to speculate as to a possible connec tion between the Soviet Union's inv tation and suggestions which hav been made, notably by Senator Wa ren G. Magnuson of Washington, an by the Oregon legislature in a mem orial to President Eisenhower, tha the present International North Pacifi Fisheries Treaty be revised or re written to include the Soviet Unio Such a proposal has also had som labor support in Canada.

The official releases dealing wit the American team's mission make n reference to such a possibl connection.

But some competent observers se strong possibility of a relation betwee these suggestions and the Soviet's ne willingness to accept a team c American fishery people.

Salmon-and-Tuna Pact With Japan Proposed

Negotiation of an actual treaty b tween the United States and Japan fo the orderly and intelligent handling c problems affecting their salmon an tuna fisheries and markets is bein proposed in Washington by Congres man Thomas M. Pelly of Washingto

He indicates concern lest conce sions touching tuna which might b made at a conference between the tw countries might have an adverse effe upon the conservation and administra tion of the salmon resource.

In a letter to Secretary of the In terior Seaton in August, Congressma Pelly suggested a new treaty whic would embody a "new, adjusted al stention agreement."

James Sinclair Named To B. C. Energy Board

James Sinclair, president of th Fisheries Association of B. C., ha been elected as one of the four men bers of the province's newly create energy advisory board.

Function of the board will be t advise the provincial government c waterpower development and its pro gram on other sources of power.

Mr. Sinclair, an engineer by pro fession, was apparently named to th board so that he could represent th fisheries interest when questions aris over joint use of river resources. Whi individual members were not name as spokesmen for any specific grou Mr. Sinclair's knowledge and exper ence of fisheries matters will be va ued when proposals relating to th Fraser and other salmon-rich rive are under consideration.

American Tuna Industry Builds Hope on Meeting

● Meeting between the Japanese and American governments, so earnestly sought by the U. S. tuna industry as a means of saving the declining tuna fishery in this country, seemed a step nearer as this issue went to press.

Following a visit of Interior Secretary Fred Seaton to Japanese Agriculture Minister Fukuda, an invitation to the Japanese government was formally extended through the U. S. Embassy in Tokyo. The State Department didn't say exactly what subjects the Japanese were invited to discuss, but the agenda is presumed to follow pretty closely the tuna industry's recommendations to State and Interior Departments, made some weeks ago and reported in the August, 1959, issue of *Pacific Fisherman*.

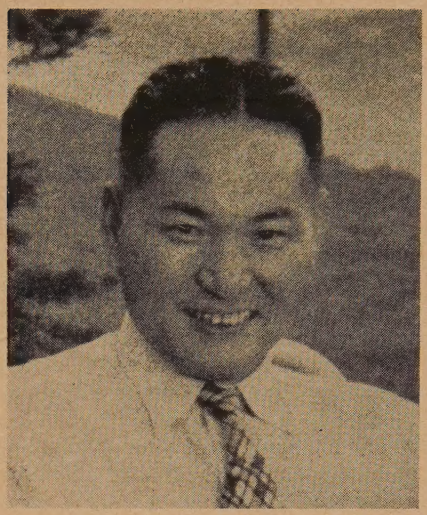
However, it was also generally presumed that the subject of greatest immediate importance—control of Japanese exports of tuna to the U. S.—was left off the agenda, by desire of the State Department.

● The news of the invitation was received somewhat differently in the U. S. and in Japan.

In the U. S. the reaction was very optimistic. Spokesmen for tuna fishermen and canners in Washington and in Southern California felt confident that the meeting would be held, and would bring good results. The fact that export and price controls would not be discussed was not considered too great a setback. The main purpose, it was said, is to get the governments into a discussion of the many problems involved in the international tuna fishery and world markets. Nothing but good can come from such an exchange of views, it was said.

In Tokyo, the reaction seemed to be little less enthusiastic. The immediate result of Secretary Seaton's visit with Minister Fukuda was the formation of a new Tuna Export Regulation Council made up of the heads of the Japan Federation of Tuna Fishery Organizations, Export Tuna Freezers' Assn., Export Tuna Canners' Association, and others.

The new council sat down to its first meeting and promptly began discussing, as subject No. 1, the very item that the State Department had excluded from the agenda for the international meeting: Adjusment of export volume and prices.



Kazuo Momoi, vice president and managing director of Momoi Fishing Net Manufacturing Co., Ako, Japan, relaxing in the Bellevue, Wash., garden of **R. D. Ladd,** general manager, Pacific Marine Supply Co., Seattle, Momoi netting distributors in the Pacific Northwest. Mr. Momoi was accompanied to Seattle by Ben Ichiyasu, chief of the American Momoi headquarters in Long Beach, Calif. The Japanese manufacturer was at the close of a business trip which took him through the United States and into British Columbia.

Japan Coy on Tuna Talk Suggesting Self-Control

(P.F. Staff Report.)

● Japan's reaction toward the American proposal for an inter-governmental conference on tuna troubles was marked by official coyness, and a strong tendency to suggest that a better approach to the problem might be through a self-governing voluntary control of exports on the part of the Japanese industry.

Secretary of the Interior Seaton was only two days out of Tokyo homeward bound before just such an organization was formed with the blessing—and actually at behest of—the Japanese Fisheries Agency.

Although he excepted the question of control over Japanese exports of tuna to the United States from the list of subjects he proposed for the inter-government tuna conference, Secretary Seaton is understood to have insinuated that this matter was at the root of the proposal.

He is quoted by informed sources in Japan as having said:

"We should like to have a government meeting between your country and ours in order to talk in general of tuna, the condition of the resource and the development of markets, but excepting the question of control of Japan's tuna export to the United States; all this for the purpose of smoothing the tuna trade between the two nations.

To which Takeo Fukuda, Minister of Agriculture and Forestry replied:

"I would like to postpone decision as to whether such a meeting should be held until after making full investigation on what problems are to be handled, and their implications. Such investigation should be made between pertinent authorities of the two nations."

● In Japan it is felt that abrupt insistence on the part of the United States on discussion of control of Japan's export trade in tuna would surely prevent any productive meeting.

Minister Fukuda is reported in discussions to have expressed the view that the basic problem might be solved harmoniously through voluntary self-governing control on the part of the Japanese industry, and that an inter-governmental meeting seemed to give the matter exaggerated emphasis.

Finally arrangement was made for discussions between the U.S. Embassy in Tokyo and the Japan Fisheries Agency to develop a concrete agenda. When this is complete the Japanese minister then will decide if the inter-governmental meeting will be held.

Tuna Conference Organized

● Two days later Fishery Agency Director Hideo Okuhara called the top executives of the three tuna industry associations together, told them of the Seaton-Fukuda discussion, and instructed them to form an advisory and policy-making council according to a formula prescribed by the Fishery Agency.

The new agency, which is called the Tuna Export Adjustment Conference, was formed on the spot with this formal objective: "In order smoothly to develop the export of tuna, as well as to aid in promoting the tuna fishing industry by intensified liaison and adjustment of view among the interested

industries in regard to the export of frozen tuna and canned tuna."

• Japan's Minister Fukuda continued to show a lack of interest in a governmental meeting at least as late as August 14, when he met in conference with U. S. Minister to Japan Thibodeau, who again pressed for a two weeks inter-governmental meeting on tuna problems in September. Indeed, there was some indication that Fukuda had avoided such a meeting until Ambassador MacArthur had urged it upon Japanese Foreign Minister Fujiyama.

Talking to Thibodeau, Fukuda is said to have argued strongly that no government meeting should be necessary; that Japan had already established a Tuna Export Adjustment Conference within the industry, and that it was competent to meet any situation. In the opinion of one commentator, as translated into English, Fukuda "made it clear that Japan had no intention to open any government meeting at this time."

However, the Fukuda-Thibodeau conference closed with the understanding that the matter would be discussed further between the U. S. Embassy, the Japanese Foreign Office, and the Japanese Fishery Agency.

A competent observer in Tokyo closed his discussion of the matter in words which translate thus: "While Fukuda rather clearly refused to open a government meeting, observers hold the view that American pressure soon will succeed in opening the conference despite Fukuda's reluctance."

CALIFORNIA SARDINES — No Fish Showing; No Price Set

• As the date — September 1 — approached for the opening of the Southern California sardine season, nobody was making any preparations to go fishing.

There being no fish around, the canneries were making no price offers to the fishermen; and the Southern California industry, as usual, was tagging along waiting for leadership from Monterey.

The Monterey season opened August 1, but so far no fish has been landed.

Although the lack of fish put the brakes on the industry generally, there were some minor questions to be answered before the San Pedro fishermen could go fishing.

Question No. 1 was price. It looks as if the opening price this season will be a long way off the $60-per-ton figure offered in September, 1958. Canner spokesmen point out that this year selling sardines is a matter of competing with South Africa for the Philippine market. Unless canners can land sardines in the Philippines at the same price or less than the South Africans, they won't sell enough sardines to operate profitably.

Inventories, canners say, are suffi cient on hand to take care of the do mestic market, such as it is.

Whether the canners can afford t offer the fishermen a price they ca fish for, remains to be seen. As w went to press, no offers had bee made.

Question No. 2 was the canner workers. Their union contract wit the canners was due to expire Sep tember 1, the very day the sardin season opens in Southern California

Obviously, if the cannery worker should not sign a new contract b that date, there would be no fishing for there would be no cannery work ers to handle the fish if and whe caught.

As we went to press, discussion were in progress, and it looked, ac cording to union spokesmen, as if new contract would be amicably ar rived at.

Wakefield Institutes U.S. King Crabmeat Inspection

Continuous United States Department of the Interior inspection of its King crab packing and packaging operations at Bellingham, Wash., was instituted by Wakefield's Deep Sea Trawlers, Inc., in August. This is believed to be the first crab meat in the United States, and certainly the first King crab meat in the world, to be packed under such inspection and certification.

This voluntary inspection was arranged by Lowell Wakefield, president of the company, just before he left for Alaska the middle of August aboard the refrigerated depot ship *Reefer King,* chartered from her owners, William D. Suryan and George Kearney of Seattle. She will give the Wakefield enterprise a second floating plant —with the *Deep Sea*—in addition to its two shore stations at Sand Point and Port Wakefield, Alaska.

King crab processed in these four plants is packaged to order in the Wakefield operation in the Bellingham Cold Storage plant, where the U.S.D.I. inspection will be conducted by Ed Johnson of the U.S. Bureau of Commercial Fisheries.

Hereafter Wakefield packaged King crab will be entitled to bear the shield-shaped certification mark which says: "Packed Under Continuous Inspection of the U. S. Department of the Interior."

North Coast Albacore Down as August Ends

After flaring brightly through July and most of August, Albacore availability in Pacific Northwest waters dwindled at the end of August, and at presstime numbers of the Southern California clippers which had been fishing off Oregon were heading south with the intention of basing their operations around Morro Bay.

Decline in fishing was attributed to weather by many of the experienced Albacore fishermen, who said the long-prevailing stiff nor'westerlies always were accompanied by a decline in availability of the tuna, while also interfering with fishing vessel operation.

What they wanted were days of thick, misty weather, with light wind and long swells; and they felt sure such conditions would bring the fish back with them.

The Albacore market at packing ports all along the coast stood at $40 through most of August, following reduction from $435 by the Souther California buyers.

With the sharp competition for fis buyers became chary of giving out in formation as to their deliveries, bu there was good reason to believe th Oregon deliveries at least for July an August were well ahead of 195 which was the best year in many.

Fish Divoteers' 21st Fall Tourney Sept. 25

Walter Johnson, of the Halibu Producers Cooperative, Seattle, pres dent of The Fish Divoteers, has an nounced that the organization's twen ty-first annual fall tournament will b held Friday, September 25, at th Rainier Golf & Country Club Seattle.

Sandoz to be Director Of Castle & Cooke

Malcolm MacNaughton, executiv vice president of Castle & Cooke, Ltd Honolulu, which holds controlling in terest in Columbia River Packers As sociation, Inc., announced in Astor recently that T. F. Sandoz, preside of the C.R.P.A., will become a mem ber of the Castle & Cooke board directors.

FOOD FISH MARKETING

News and Views of National Trade in Fish and Shellfish

Section of PACIFIC FISHERMAN — September, 1959

Tuna Tie-up Loosens; Seiners' Catches Good

● Tie-up of the San Diego tuna clipper fleet loosened when National Marine Terminal Co. offered to pay its engineers and fishermen on a basis of $270 a ton for Yellowfin and $230 a ton for Skip-jack—the old "floor" prices that had held firm as minimums for almost two years of American Tunaboat Assn. auctions.

The National Marine fleet fishes for Westgate-California Co., with which it is affiliated. The engineers' acceptance of the owners' price made it possible for the boats to sail, and the same offer was accepted by one or two independent clippers.

While the engineers had stuck to their $270-$230 minimum, the fishermen's union had voted to go fishing either for auction prices or for some price related to the world price of tuna.

At the end of August, approximately one quarter of the clipper fleet had sailed, the independent vessels planning to sell their catches at auction through the American Tunaboat Association. Another quarter of the fleet was fishing for Albacore, and the rest of the vessels remained tied up. Two boats had left San Diego headed for South American waters, where they will fish with foreign crews.

Seiners Keep On Fishing

● The San Pedro purse seiner fleet, meanwhile, continued to fish for prices of around $250 for Yellowfin, $210 for Skipjack and $240 for Bluefin.

Fishing was not bad, according to the statistics issued by the Market News Service of the Bureau of Commercial Fisheries. In the weeks between July 8, when the seiner fleet resumed fishing after a tie-up of more than two months, the net boats had caught 5,867 tons of fish, as against 8,353 for the same period last year. However, that 1958 total includes the phenomenal catches of Bluefin brought in in mid-July last year. In two of those July weeks the seiner fleet netted 2,908 and 2,911 tons, which is far above normal.

The year-to-date purse seiner total reported by the Market News Service up to August 8 was 27,290 tons, as against 29,071 tons last year; so the long tie-up has not caused such a steep drop in the total as one might think would result from two months' idleness.

Clipper Catch Down

The tuna clippers, meanwhile, showed a substantial drop in landings, the figure sliding to 50,697 from a 62,158 total for the Jan. 1-Aug. 8 period in 1958.

Albacore Up and Down

Albacore fishing, as usual, was erratic. The total California landings for the period from Jan. 1 to Aug. 8 were 4,511 tons, officially; but the figure includes a lot of fish trucked down from the North, where the longfins are running strongly. For the same period in 1958, the figure was 5,155.

After a slow start, the albacore fishery picked up nicely in mid-July, and for one week, July 19 to 25, cannery receipts were reported by the Market News Service at 1,825 tons, well over the same period last year (1,314 tons). But by the end of July landings were down again.

Albacore prices were set at $400 ton for fish under ten lbs., and $435 for fish over 10 lbs., but in mid-July canners dropped their offers to $400 straight. This meant a cut for the fishermen.

Export Salmon Buying is Lively Despite Prices

● Hectic conditions prevailed in the canned salmon selling business through August, with the naming of domestic prices at new high levels; and with buyers for Britain paying these prices for the items they wanted without evidence of agony.

As a matter of fact, substantial orders for Sockeye halves were placed in Canada and the United States for export at $24 even before such goods were offered for domestic sale at this same figure.

● *Opening prices* were named late in August by Calpak and Libby as follows:

Red talls	$37.00
Red halves	25.00
Pink talls	24.00
Pink halves	13.50
Chum talls	21.00
Chum halves	12.00*

*Libby only.

The trade generally followed these prices except for Reds, where most quotations were $36 for talls and $23 for halves. A further variation was noted in some quotations which made no distinction between Alaska Reds and Puget Sockeyes, pricing all Red Sockeyes at $24.

● Export interest centered in Sockeye halves and quarters, with the latter item particularly sought after.

Sockeye quarters for export sold readily at $13.50, and it is known that $14 was paid before the end of August.

The export buyers' willingness to pay current prices without the usual measure of protest generally is attributed on the Pacific Coast to commercial strategy related to carryover of $18.50 Sockeyes, which have now become highly attractive property.

● Not a little of the zest which marked the export aspect of the salmon market in August drew from the increased French authorizations and the new availability of Australian exchange for salmon purchase.

Both of these countries were actively interested in salmon and, while their interest as to variety differed, both at a somewhat higher level than in earlier years. Thus, with Cohoes short everywhere—U.S., Canada and Japan—Australia was interested in Sockeyes, which are also scarce.

Wide Gap in Price Ideas Blocks Sardine Activity

• August 1, supposedly the opening date of the central California sardine season, was just another day as far as fishing activity was concerned. Monterey's fleet of some 20 odd purse seiners swung idly at moorings, and there was no steam up in the canneries.

The reason for this was that no price had been arrived at for the price of fish from canners to boat owners cooperatives. The best offer received by boat owners as of Aug. 17 was $27.50 per ton, and they weren't turning over their engines for that.

In 1958 one canner in Moss Landing and one canner in San Francisco started receiving fish Aug. 4 at $60 per ton, less trucking charges. The rest of the canneries started Aug. 12 at $60 per ton also. Toward the end of the season the price dropped to $50 per ton.

Among the canneries ready to operate this year are: J-D Packing Co., San Francisco; Santa Cruz Canning Co., Moss Landing; Enterprise Packers, San Xavier Fish Packing Co., Carmel Canning Co., California Packing Corporation, and Hovden Food Products Co.

The problem seemed to be that, according to well informed estimates, there were about 250,000 cases of California sardines unsold from the 1958 pack. Very little in the way of negotiations was going on in Monterey, and no enthusiasm was being shown by anybody, according to reports.

California Mild Cure Makes Strong Contributio

Despite a sharp up-turn in Califo nia curing during the month of Jul the Davis and Dignon estimate f Pacific curing through that mon failed to reflect the general stro trend of earlier data.

Estimated total pack to Aug. 1 w 7,375 tierces, with Alaska accounti for 3,334; Puget Sound only 1,40 British Columbia 537; and Californ an "informed estimate" of 2,100.

They Add Up To A Lot of Sales!

Oceanic

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For over 65 years..

Bumble Bee has upheld and extend the reputation of the seafood cannin industry by processing and marketin products of the finest quality.

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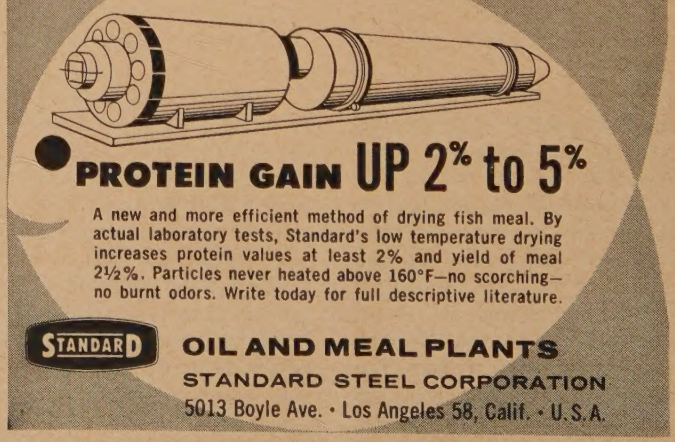
Columbia River Packers Assn., Inc. Astoria, Oregon

Tuna, Salmon, King Crab Meat, Frozen Seafoods, Seafood Delicacies



PROTEIN GAIN UP 2% to 5%

A new and more efficient method of drying fish meal. By actual laboratory tests, Standard's low temperature drying increases protein values at least 2% and yield of meal 2½%. Particles never heated above 160°F—no scorching—no burnt odors. Write today for full descriptive literature.

STANDARD OIL AND MEAL PLANTS
STANDARD STEEL CORPORATION
5013 Boyle Ave. • Los Angeles 58, Calif. • U.S.A.

California Imports of Frozen Tuna

Cumulative data in tons for 1959 through Aug. 15, and for other years to the nearest comparable date. Data from U. S. Market New Service

	Albacore	Skipjack	Yellowfin	Unclassified	Total
San Francisco	715	151	6,159	...	7,025
San Pedro	7,157	5,038	28,533	160	40,888
San Diego	713	203	3,129	...	4,045
Total to Aug. 15	8,585	5,392	37,821	160	51,958
1958	10,493	3,023	30,600	328	44,444
1957	15,150	7,440	16,272	280	39,142

Southern California Domestic Tuna Deliveries

Cumulative totals for 1959 through Aug. 15, in tons, as reported by U. S. Market News Service

	Albacore	Bluefin	Skipjack	Yellowfin	Bonito, etc.	Total
Clippers and Albacore Fleet	5,983	16	35,637	21,610	3	63,249
Purse Seiners	...	4,974	6,017	20,799	311	32,101
Total 1959 through Aug. 15	5,983	4,990	41,654	42,409	314	95,350
Total 1958	6,134	9,788	35,588	48,976	1,711	102,197
Total 1957	8,269	5,927	26,153	53,167	...	93,516

N.F.I. Cured Fish Men Scrutinizing Additives

Food and Drug Administration proposals for regulations dealing with the use of additives for cured fish will come under close scrutiny at a meeting called for Chicago September 15 by Louis Vitale of Los Angeles, chairman of National Fisheries Institute's committee on smoked and cured fish.

He is working with Arthur H. Frohman, Region VI vice president of NFI, in arranging a meeting which can be of the utmost importance to fish smokers and curers.

TWO GREAT BRAND NAMES IN FROZEN FRESH SEAFOODS

SAN JUAN

Ship Ahoy

FRESHEST FISH IN THE FREEZER

More than 37 Delightful Frozen Seafoods in Both Brands

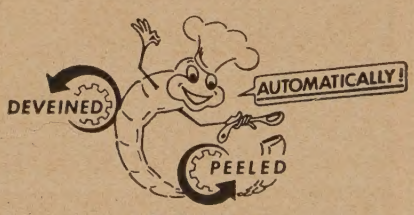
NEW ALASKA KING CRAB MEAT

6 oz—1 lb—2½ lbs—5 lb sizes

SAN JUAN FISHING & PACKING CO.
PIER 31—SEATTLE, WASH.

More plants than ever before now process shrimp with Peelers Company Machines*

*The Peelers Co. specializes in shrimp peelers, deveiners, and graders.



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THE PEELERS CO.

619 S. Peters St. • New Orleans, La.

Write, wire, or phone

Frohman Brothers Tour Pacific Producing Areas

Arthur and David Frohman of L. H. Frohman & Sons, Chicago fish distributing firm, spent the latter part of August on a trip to the Pacific Coast, in which they visited in particular the New England Fish Co. and Canadian Fishing Co. headquarters. Their firm distributes the products of these primary producers in a large area of middle America.

Arthur Frohman retired as national secretary of the National Fisheries Institute September 1, but merely shifted his N.F.I. responsibilities, as he simultaneously became vice president heading the Institute's Region VI. From Seattle he continued to California to visit other producers of fishery items handled by the Frohman firm, while David Frohman returned to Chicago.

Quality
Pink Salmon
KELLEY-CLARKE CO.
2460 6th Ave. S.
Seattle 4, Washington

California Canned Fish Prices

Current regular quotations by San Pedro, Los Angeles, and Monterey brokers and cannery representatives, f.o.b. canner's terminal.

Product	$/Case
ANCHOVIES (in tom. sauce):	
5 oz. 100's	$ 5.50- 6.00
1-lb. oval 48's	7.00- 7.50
MACKEREL:	
Pacific tall 48	7.50- 8.00
Jack tall 48	7.50
SARDINES:	
Natural tall 48	5.40- 5.75
Sauce (1-lb. oval) 24	3.75
Sauce (1-lb. oval 48	7.50
TUNA (advertised brands):	
White fcy. (7 oz.) 48*	15.00
White chunks (6½ oz.) 48*	13.25
White chunks (9¼ oz.) 24	9.20
Light fcy. (7 oz.) 48**	14.25
Light chunks (6½ oz.) 48*	12.50
Light chunks (9¼ oz.) 24**	8.70
Grated (6 oz.) 48	7.75-8.00
TUNA (other packer's labels):	
White fcy. (7 oz.) 48*	13.50
White chunks (6½ oz.) 48*	12.00
Light fcy. (7 oz.) 48	10.75-11.00
Light chunks (6½ oz.) 48	9.00- 9.25
Grated (6 oz.) 48	7.50
SQUID:	
In brine, No. 1 tall (16 oz.) 40	5.00- 5.75

*Mostly withdrawn from the market pending possibility of new price lists.
**Some substantial trade discounts for volume sales and display allowances reported.

Imported Canned Tuna Prices

Current prices as reported by importers and brokers, f.o.b. warehouse Los Angeles and San Francisco.

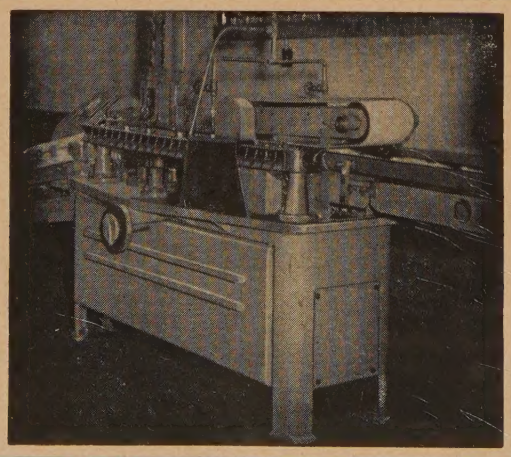
TUNA IN BRINE (Japanese):	
White solid (7 oz.) 48*	
White solid (13 oz.) 24*	
White solid (4-lb.) 6*	
Light solid (7 oz.) 48	$ 9.00- 9.50
Light solid (13 oz.) 24	8.70- 9.00
Light solid (4-lb.) 6	10.15-10.50

*Supplies about exhausted. Quotations withdrawn.

Seattle Market

Market prices currently quoted at presstime by Pacific Northwest brokers and cannery sales department, cases of 48 tins, unless otherwise specified, good quality, as reported by the U. S. Bureau of Commercial Fisheries, Market News Service.

Items and Packages	Per Case
Puget Sound	
Sockeye, halves	$23 -24
Sockeye, quarters	13.50-14
Alaska	
Red, talls	35 -37
Red, halves	23 -25
Pink, talls	23 -25
Pink halves	13.50-14
Coho, talls	29 -31
Coho, halves	17 -18
Coho, 4-lbs. (12)	31 -33
Coho, quarters	10.50-11
Chum, summer, tall	20 -21
Chum, summer, halves	11.50-12
Chum, 4-lbs. (12)	20 -21
Chinook, talls	-30
Columbia River	
Blueback, halves	23.50-24
Blueback, quarters	13.50-14.50
Chinook, fancy, halves	-26
Chinook, fancy, quarters	14 -14.50
Chinook, choice, halves	17.50-18
Chinook, choice, quarters	-10.50
Silver, halves	-17.50
Silver, quarters	11 -11.75
Tuna, Northwest Pack—	
Albacore, fcy., 7 oz.	13.50-14
Yellowfin, chunk, 6½ oz.	9.50-10.50
Tuna, Featured Pack—	
Albacore, fcy., 7 oz.	14.85-16.25
Albacore, fcy., 3½ oz.	9.10- 9.65
Albacore, chunk, 6½ oz.	12.50-14.25
Albacore, chunk, 3 oz.	7.50- 8.
Lightmeat, fcy., 7 oz.	14.25
Lightmeat, fcy., 3½ oz.	8.55
Lightmeat, chunk, 6½ oz.	11.00
Lightmeat, chunk, 3 oz.	7.50
Canned Crab—	
Dungeness, 24, 6½ oz.	12.50
Dungeness, 3¾ oz.	7.50
King, 48, 7½ oz., fcy.	29
King, 24, 15 oz., fcy.	26.50
King, 24, 7½ oz., fcy.	14.60
Northwest Shrimp—	
Wet Pack, 24, 4½ oz.	7.25
Alaska Shrimp—	
Tiny, 24, 4½ oz.	7.50
Small, 24, 4½ oz.	9
Medium, 24, 4½ oz.	10



The PAK-SHAPER

PREFERRED BY LEADING TUNA CANNERS!

Introduction of the PAK-SHAPER in 1949 developed in tuna canning a greater mechanization than had come about in 30 years of previous growth. Subsequent experience has proved its value to the industry. A large percentage of major tuna operators now employ the PAK-SHAPER.

The PAK-FORMER, designed exclusively for Chunk and Grated Style Pack, is now available to the tuna industry under similar terms as the PAK-SHAPER.

For Complete Information Write to

E. H. CARRUTHERS CO.
P. O. Box 1322, Warrenton, Oregon

Have businessmen met their obligation in public affairs?

American Can Company believes more can be done by business leaders to strengthen our economic system and protect our American way of life. Here is our program:

Business, large or small, operates in a world in which powerful forces are at work marketing ideas that undermine our political and economic system. The public is being hoaxed into believing that the nation can consume more than it produces, that our standards of living can be increased by restricting output and reducing hours of work, and that the "good life" is a life of irresponsibility. The belief is fostered that through taxing and spending a more powerful central government can take care of everything.

We believe management leaders must find a way to put industry in its true perspective, and to convince the public that our principles and methods are in the interests of everyone, not just a few.

Our program of information and education:

FIRST—we encourage everyone in our management to discuss and take a firm stand on issues that directly affect the welfare of our nation, our company and its people.

SECOND—we let every employee know exactly what we stand for, and why. We provide them with a constant flow of facts and viewpoints. We are hopeful their good sense will lend support to our ideas.

THIRD—we give our managers the opportunity to study political processes and learn the art of practical politics. We urge them to take an active role in local politics in the party of their own choice—on their own time, at their own expense.

FOURTH—our views on important issues are made known in full detail to the top management people, who have been designated as company spokesmen. After careful study of these views, they give their own conclusions to the Congressmen and Senators representing those areas where Canco facilities are located.

We believe such a program is good—good for business, good for people in business, good for the nation. We hope you will realize its importance and, if you have not already done so, we suggest that you instigate similar action in your own organizations.

CANCO

American Can Company

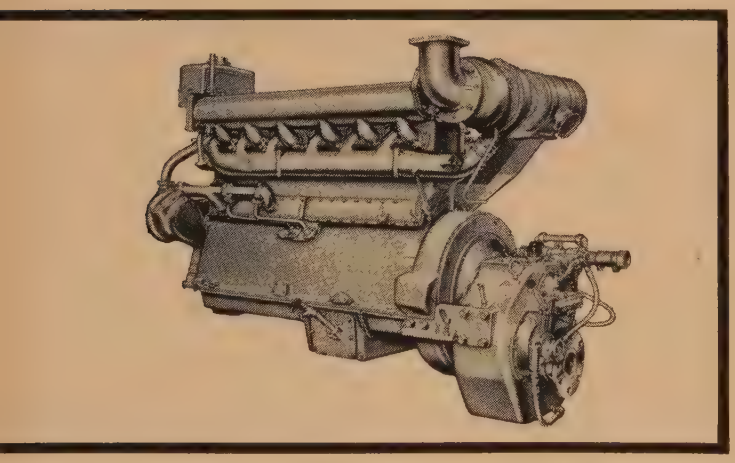
engine power
BY CATERPILLAR

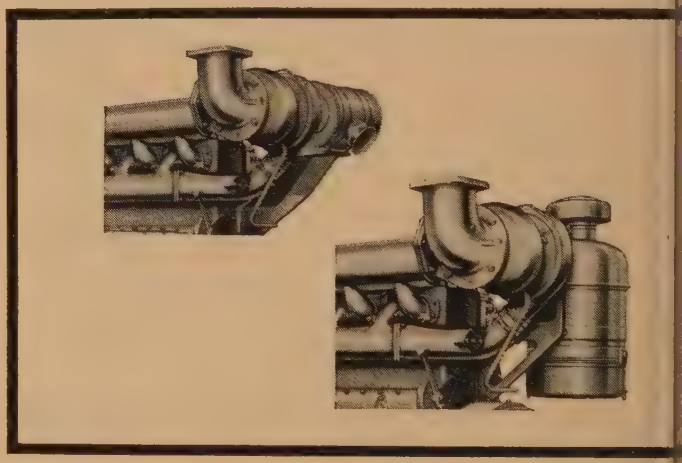
Announcing the new Cat D342 (Series C) Turbocharged Marine Engi

Now when you repower, or specify power for a new boat, the new Cat D342 (Series C) Turbocharged Marine Diesel gives you increased output and performance in less space.

There's lots that's new in this new engine—the turbocharging system, and the air cleaner, for instance. The exhaust manifold is on top of the engine and the intake manifold runs alongside the engine. Air cleaner and turbocharger are rear mounted. Result: lower profile dimension and compactness to give you new installation flexibility. And the basic features that have earned the "workhorse of the shrimp boat fleet" title for the basic D342 Marine Engine are here, too. Together, these features mean as much dependability with as little maintenance cost as it's possible to put in a Marine Diesel.

For complete information on this brand-new engine, call your Caterpillar Dealer. For literature, write us for "Features and Facts—Caterpillar D342 (Series C) Turbocharged Diesel."





Continuous ratings both forward and reverse for the D342 (Series C) Turbocharged Marine are 220 HP at 1225 RPM. New Twin Disc MG 512 reverse and reduction gear is available in 2:1 or 3:1 ratio. Note top-mounted exhaust manifold, side-mounted intake manifold. Air cleaner and turbocharger are rear mounted. Compactness adds to installation flexibility.

Illustrations show proven Caterpillar turbocharging system. This gives you increased horsepower with excellent operating economy on No. 2 fuel oil, and many of the new economy diesel fuels. "Premium" diesel fuel can be used, but is *not* required. New dry-type air cleaner (upper) is standard. An oil-bath-type (lower) is an optional attachment.

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U.S.A. Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Cat D342, traditional workhorse of the shrimp fleet, now has a big brother in the Series C Turbocharged Marine Engine with increased horsepower.

For new work boats or repowering old ones, Cat Marine Engines are first with profit-minded owners. They're dependable *and* economical.

***Honest horsepower.* Your engine comes with a *notarized* certificate of power, backed by Caterpillar Tractor Co. You get what you're promised.**

PACIFIC FISHERMAN September, 1959

ELECTRONICS In Fishing —A Boundless Scene

● Electronics in Fishing—

Here is a boundless scene, whose borders we cannot yet discern. We can know the little portion of it which Man has explored, and can descry dimly Islands of Opportunity along the present horizon, coming barely into view as through slowly rising mists.

Fanciful? Yes, perhaps; but so were today's commonplaces in Electronics in Fishing only a dozen years ago.

● To trace the effective application of Electronics in Fishing over a period of a decade plus:

To examine the ground that has been gained;

To search beyond the borders of the known as exploring fishermen, spurred by science and the promises of success, push those borders further and further;

To glimpse something of the future through the projection of today;

To show fishermen a little of what science creates for their use, and the scientist something of what the fisherman needs and how he uses what he has—

These are the objectives of *Pacific Fisherman* in undertaking this examination of the stimulating subject: *Electronics in Fishing.*

● Approaching a highly technical subject, we have sought to deal with it in non-technical manner; as *applied* science, applied by fishermen to the problems of catching fish.

We have consulted practical fishermen, and particularly those whose vision reaches out to the dimly-seen opportunities.

We have interviewed researchers seeking means by which the mysterious faculties of electronics can be brought to bear upon one of Man's oldest crafts, that of winning food from the waters.

We have consulted the manufacturers who translate the findings of science into the instruments of use, instruments capable of plumbing the sea, of resisting its corrosive brine, and the rugged demands of marine service.

We have sought to marshal and study the *facts of use,* the *needs of the fishermen,* and the *trends of technology,* and from them to draw a concept of the future's promise.

● Electronic physics have been defined broadly in our study, and the purist will doubtless find instances where we are concerned with electrical rather than electronic instruments.

In some cases we have chosen to include fishing application of instrumentation which actually involves neither electronic nor electric physics; but which is sufficiently related to the subject of scientific advance in fishing to justify its inclusion in a study which seeks to analyze the courses we shall cruise and the horizons we shall fish tomorrow, on, in and at the bottom of the sea.

● Progress made in a dozen years in applying electronic physics to the practical uses of the industrial fisherman is breath-taking; but it is only a beginning.

Our editorial studies of the subject have made this plain.

We are in a stage of accelerating development toward boundaries we cannot see.

We can locate our position on the face of the sea instantly and with precision new to the whole story of navigation. We can sound the deepest sea a hundred times a minute, and accurately to a fathom. We can see fish beneath our keel, how many they are, and how deep they swim.

We can look around us beneath the sea, but our eye cannot discern nor mind grasp the future of Electronics in Fishing. It lies somewhere ahead, glowing with promise.

ELECTRONICS in FISHING

— The Technological Drama Opens —

● Electronics obviously found their first application in fishing through the application of wireless telegraphy, and particularly the radiophone, in the field of communications.

Because this use is so well established, and has served in fishing for so many years, general application of electronics in this area will not be dealt with here in any detailed way. However, there are grown up within modern fishing methods certain specific applications of radio communication to cope with particular problems. These will be examined, as will modern methods of improved communications, or of applying the facilities of radio communication in specially effective manner.

● Historically, application of electronics to the problems of fishing vessel navigation undoubtedly followed their use in the field of communications.

The radio direction finder provided for the progressive fishermen of a generation ago an aid in fishing whose benefits ran well beyond those of safe navigation. The fishermen who found a favorable spot could return to it again with the aid of accurate bearings provided by the same radio direction finder which showed him the way to port or the location of known hazards.

Automatic steering followed closely, and was of particular interest to fishermen. Some of the earliest devices in this field had their origins on Puget Sound as inventors hearkened to the demands of trollers and seiners.

The Photo-Electric Pilot and Wood Freeman's Metal - Marine Pilot came out of Tacoma as perhaps the first applications specifically to fishing of the automatic helmsman. Mr. Freeman, himself a troller, turned to inventing a means of handling the helm while he, alone in his boat at sea, sought to catch some sleep while running to port. His "Iron Mike", as he called it early, was developed after two previous primitive devices had been tried. One of them made use of a trailing line to correct the helm when the boat fell off her course, and the other utilized the prevailing wind to hold the boat to a course as faithfully as the nor'western itself was faithful.

That was in the early 'Thirties. The first Metal Marine Pilot was housed in a Pyrex casserole with a gasket around the cover and the tip of the cover knob ground off as a lead-in for the wiring.

Descendants of this primitive prototype have steered boats home for sleepy lone trollers for a quarter-century.

The Trawler's Special Need

● Need, more than technical development or market availability, dictated the next great stride in applying electronics to fishing.

On the Pacific this was the almost spontaneous development of ocean trawling in the middle-to-late 'Thirties.

Of a sudden, men who had been seiners and trollers and longliners went trawling in the off-seasons for salmon and halibut. Dragging their nets on the bottom of the sea, they needed to know —*right now*— where that bottom was, how smooth it was, and where it dipped into gullies rimmed with those richly productive edges.

Echo-sounders had served big ships, and the progressive trawlers were quick to see their applicability to the draggers' dilemma. They could trace for him the high-yielding rims and rockfish-rich gullies; pick out the destructive rock piles which wrecked his nets; and by the crispness of their returning echo signal show him when he was over the soft bottom where the Dover sole abound, or above the sandy ground beloved of petrale.

Here was the fisherman's friend, and the dragger depended upon his sounder almost as much as upon his diesel, and with it went tap-tapping as he traced out the unknown banks for the now swift - growing fishery. Pacific trawling rocketed from its bare beginnings about 1937 to full stature before the end of World War II.

In these years of growth, war demand spurred men to the effort, and the tap-tapping echo-sounders showed them where to fish.

Then it was that Electronics in Fishing became a dominant factor in the industry, for which they opened a new day.

From War the Tools of Peace

● World War II worked change in all activities of men, and many o Nature.

Development of electronic applica tions in the years of war progressed at a pace which peace could not hav produced. Unlike many military expan sions, electronics are directly appli cable to peace and rising standards o living and productivity.

Electronic applications to weapon and military uses proved of equal ad vantage in peacetime industry; and a many of them were of naval origin or employment, they could be trans lated with special effectiveness to fish ing.

Radar, sonar, loran; the super sounders and the hyper-sensitive re ceivers, all these found their place i industrial fishing immediately follow ing the war—and changed fishing s profoundly that the effect continue and at accelerating pace.

● Basically, it is with the coming o peace following World War II tha this study is begun.

It is with the applications, the ac complishments, the equipment, its ef fectiveness, and the future's promis of Electronics in Fishing in these year following war that our study and ana ysis is concerned.

We are concerned with the prin ciples, equipment and methods of th present and future, rather than wit the historic steps leading up to them

We are examining the data fro the standpoint of the informed indu trial fisherman, rather than that o the physicist.

We are recounting the practical ap plications, rather than the theoretic possibilities.

We speak of instruments as the *serve*, not as items in an equipme catalogue.

We have sought the views of scie tists, but have given particular weig to the experience and opinions of th technologists and manufacturers wh apply the findings of science to in struments for industry, and of th practical fishermen who employ th equipment in fishing.

The Infinite Possibilities

● Analysis of the problem of presenting effectively and logically the subject of "Electronics in Fishing" has led to a decision to divide it into five broad topics:

1. Sounding.
2. Navigation.
3. Communication.
4. Ranging.
5. Specialized functions.

Under each of these we shall discuss equipment used, and how; the applications which fishermen have found of value; and the experience of practical operators and manufacturers.

In addition, we shall offer articles from or interview with scientists, technologists, manufacturers and fishermen as to specific principles, the equipment applying them, and the results achieved.

● Going further, we shall trace the application of Electronics in Fishing of specialized character, in activities which may make use of several distinct applications of the physical principles of electronics.

Trawling by the very nature of the method is perhaps the manner of fishing which profits most from electronic instruments and their applications.

Seining benefits in growing degree from sounding and ranging gear.

Long-lining is a branch in which the potential is only being realized.

Whaling provides a field of use in which competitive considerations are of decided importance.

Such specific applications to specialized fisheries, plus the infinite possibilities of explorations within the Deep Scattering Layer, lie within the scope of our study.

D. S. L.—

Exploring the Productive Horizon Which Rises and Sinks in the Sea

● Opportunity potential for economic employment of electronic equipment in fisheries reaches a peak in the application of such instruments to detection of the position and movement of the nebulous band of plankton and minute ocean life designated by scientists as the Deep Scattering Layer, which for convenience they abbreviate as DSL.

Presence of this vague body in the sea was detected a decade or so ago by naval oceanographers studying the echo-sounding recordings. They were uncertain as to its composition—and to this day full scientific proof is lacking—but formed the original hypothesis when they found that the DSL rose to or near the surface at night, sinking gradually as daylight returned, until it rested on or near the bottom—and in some instances appears even to penetrate the bottom.

Another and economically significant discovery was the detection by means of high-frequency sounders with extreme sensitivity of larger fish within the DSL and evidently feeding upon the plankton composing it—or upon primary predators not differentiated by the sounder from the planktonic forage organisms.

● The Japanese were quick to sense the significance and opportunity afforded by this proof of the attraction of commercially valuable species to the feed concentration composing the DSL; and they have developed instruments designed to exploit this opportunity for at least two forms of gear—tuna longlines and salmon gillnets.

Remarkably effective and remarkably practical work along these lines in Japan has stemmed from Dr. Tomiju Hashimoto, specialist in this field in the Fishing Boat Laboratory maintained by the Fisheries Agency of the Japanese government.

This brilliant scientist not only has done much pioneering work himself but has stimulated numerous colleagues to significant contribution. Moreover, he serves as well as consultant to Japanese electronic manufacturers, thus keeping close to the economic and production problems of application as well as to the experimental and theoretical phases.

His mark on the chart of Japan's record in the field of underwater electronics is sharp and clear, of assured permanence.

Dr. Hashimoto, Pathfinder of DSL

● Dr. Hashimoto is an enthusiastic advocate of ultrasound for the detection of fish and the DSL, his work indicating decided advantages for frequencies on the order of 200 kc.

He notes in particular that the *reflection loss of ultrasound from a fish school decreases as the frequency rises.*

On the other hand, the *reflection loss from the sea bottom tends to increase with higher frequency of ultrasound.*

Practical effect of this phenomena sometimes is to render the echo from a school of groundfish stronger than that from the sea bottom itself.

Frequency on the order of 200 kc. also has been found by Dr. Hashimoto to give a better reflective coefficient from individual fish, which to a large degree compensates for some increase in attentuation of the echo. This finding is put into practical use by several Japanese manufacturers of equipment specially applicable to the problems of tuna longline fishing.

These manufacturers have developed commercial sounders with sensitivity sufficient to permit identification of fish as to species with a fair degree of reliability by the shape of the individual traces from single fish. It must be acknowledged that this identification is based primarily upon the size and shape of the individual fish;

New electrical trawl cable make

The "John N. Cobb," exploratory fishing vessel of the U.S. Fish and Wildlife Service, trawling with the new Tiger Brand Amergraph Armored Electrical Cable.

How Amergraph Electrical Trawl Cable can be used with electronic and electrical equipment

Depth Telemetering for fishing with a mid-water trawl to tell the exact depth at which the net is fishing in water where fish have been indicated by echo sounder or ranger. A miss of a few fathoms may lose the fish.

On-bottom indicator. This device shows a beam of light in the pilot house when the trawl doors are on bottom. The light goes out if the gear rises off the bottom.

Ground speed indicator. Similar to a speedometer. Reports actual rate of movement of the trawl over the ground without reference to wind, current or propeller rpm.

Thermo-electric fishing. Fish concentrations may be governed by small changes in temperature. This device indicates the temperature at which the gear is fishing.

Attraction by light. Underwater lighting, used properly, may be developed to attract fish into the path of the trawl.

Monitoring the catch. A device to report changes in the strain between the trawl and the doors would indicate a heavy or light catch.

t easier to catch more fish

A new steel armored trawl cable carrying electrical conductors has recently been developed and produced by the American Steel & Wire Division of United States Steel. This makes possible a wider use of electrical and electronic devices in commercial fishing to indicate the exact depth of the net, when it's on bottom, the ground speed of the trawl, size of the catch, and other important information.

The cable was developed in conjunction with the U.S. Bureau of Commercial Fisheries and was successfully tested on their exploratory fishing vessel, the "John N. Cobb," in the Northeastern Pacific. This work was under the direction of Richard L. McNeely, electronic scientist for the Bureau.

The conductor cable, which is known as a USS Tiger Brand Amergraph type cable, consists of a normal steel trawl warp with a center of six specially insulated, ultra-flexible copper conductors. On the "John N. Cobb," 3000 feet of the cable were used as one of the trawler's warps. After 50 tows had been made, there was no sign of damage or fatigue noted—and no apparent damage to the electrical conductors.

A product of USS Research. The Amergraph cable was perfected through the experience and ability of engineers at American Steel & Wire to produce a wide variety of electrical wire and cable. These men are constantly at work developing new and better cables for specific jobs in industry. Feel free to call on them for help.

For more information on USS Tiger Brand Amergraph Trawl Cable, write to Columbia-Geneva Steel, San Francisco, or American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio.

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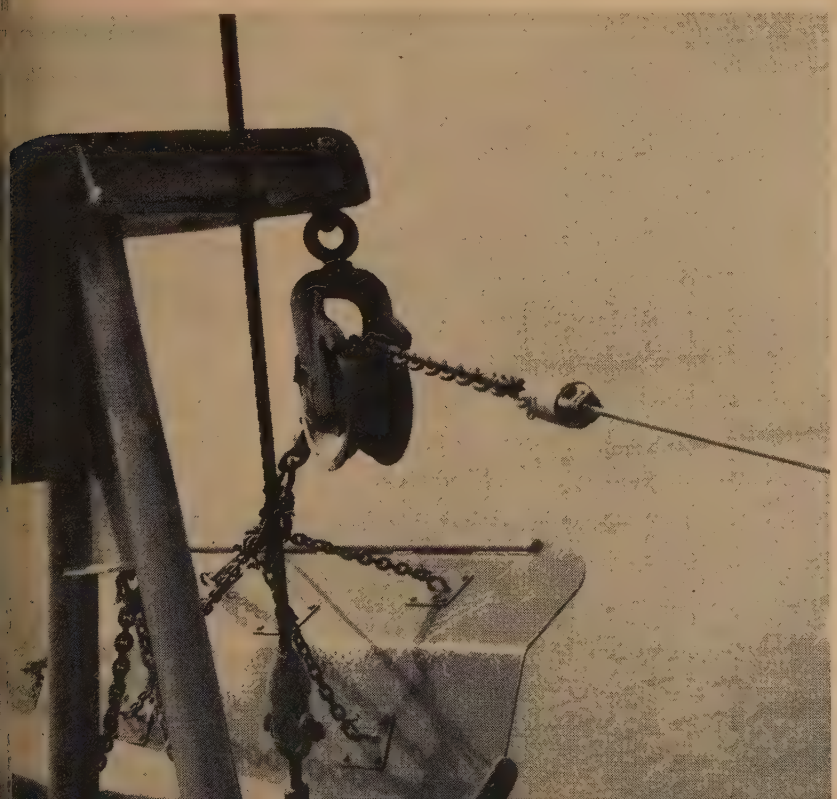
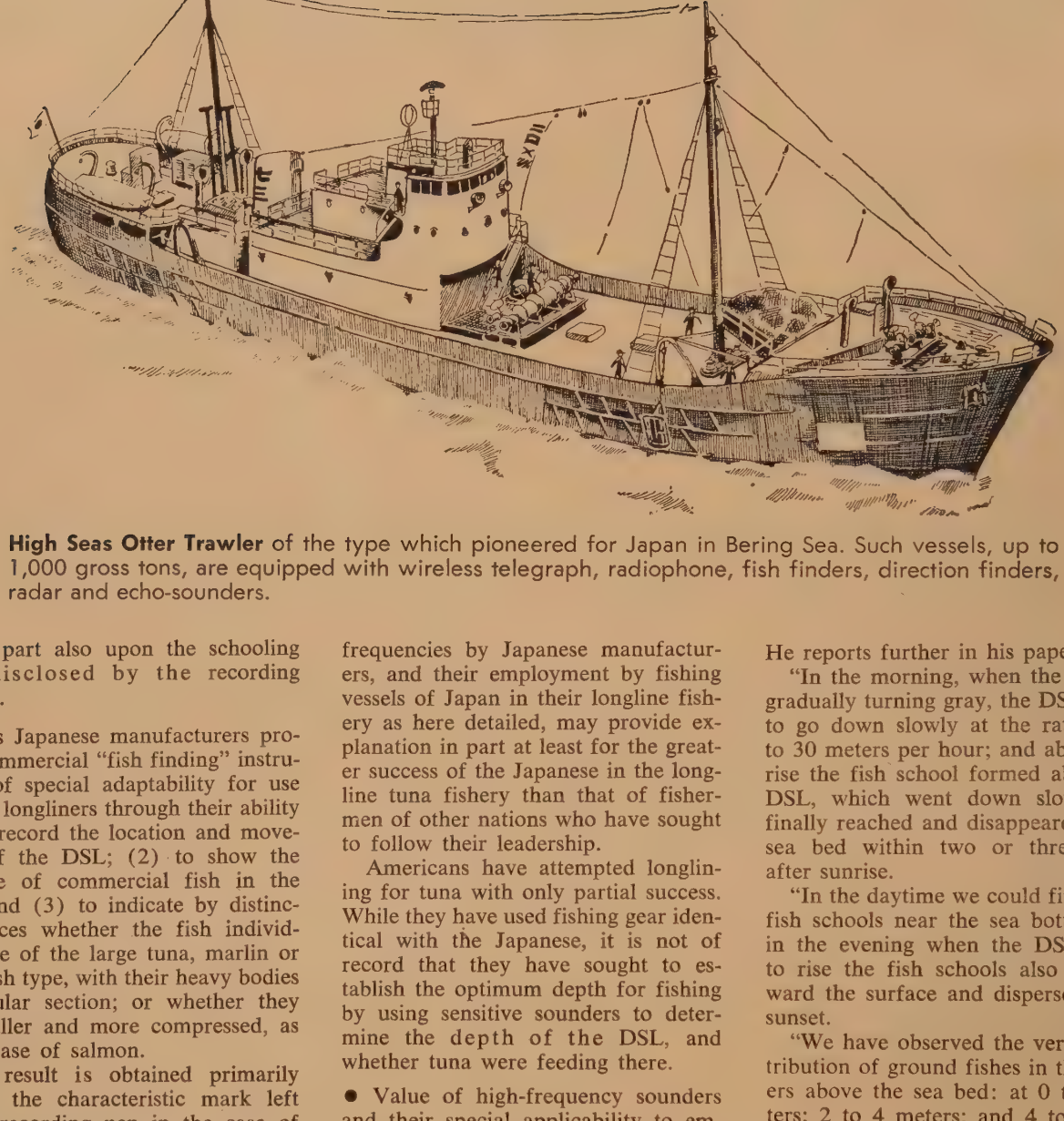
American Steel & Wire
Divisions of
United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, Distributors Abroad

Pressure-sensing unit attached to the end of the electrical trawl cable just in front of a trawl door. Exact depth of the net is indicated on a depth meter in the pilot house.



Hauling in the net with USS Tiger Brand Electrical Trawl Cable which showed no signs of wear or damage after 50 trawls.



High Seas Otter Trawler of the type which pioneered for Japan in Bering Sea. Such vessels, up to 1,000 gross tons, are equipped with wireless telegraph, radiophone, fish finders, direction finders, radar and echo-sounders.

and in part also upon the schooling habit disclosed by the recording sounder.

● Thus Japanese manufacturers produce commercial "fish finding" instruments of special adaptability for use by tuna longliners through their ability (1) to record the location and movement of the DSL; (2) to show the presence of commercial fish in the DSL; and (3) to indicate by distinctive traces whether the fish individually are of the large tuna, marlin or swordfish type, with their heavy bodies of circular section; or whether they are smaller and more compressed, as in the case of salmon.

This result is obtained primarily through the characteristic mark left by the recording pen in the case of heavy-bodied fish such as tuna, where the trace takes the form of an inverted V. This shape is believed to be produced by a "shadow" left by the impulse striking the curving side of fish of large, round section, thus producing an upward-pointing triangular trace, in contrast to the simple vertical dash resulting from contact with smaller individuals of more compressed section.

Knowing the location of the DSL, and the presence in it of tunas and spearfishes amenable to capture by longline means, the fishing master rigs his buoy lines to lengths which will present the baited gear to the tuna working in the productive horizon of the DSL.

The DSL and Fishing Efficiency

● Japanese development of these specialized sounders employing ultrasonic frequencies by Japanese manufacturers, and their employment by fishing vessels of Japan in their longline fishery as here detailed, may provide explanation in part at least for the greater success of the Japanese in the longline tuna fishery than that of fishermen of other nations who have sought to follow their leadership.

Americans have attempted longlining for tuna with only partial success. While they have used fishing gear identical with the Japanese, it is not of record that they have sought to establish the optimum depth for fishing by using sensitive sounders to determine the depth of the DSL, and whether tuna were feeding there.

● Value of high-frequency sounders and their special applicability to employment with respect to the DSL are not limited to longlining for large fish such as tuna, swordfish and marlin.

Dr. Hashimoto reports as well upon the results obtained in the detection of groundfish and the DSL in actual trawl fishing on the East China Sea. He used three sounders, all with transducers installed on the same side of the same boat. Two of the instruments were of 50 kc frequency and the third of 200 kc.

While all three sounders worked equally well for the detection of individual fish when the vessel was stopped, the effectiveness of the lower frequency units fell rapidly when the boat was running, while the 200 kc instrument continued to perform at full efficiency.

The 200 kc apparatus also proved particularly adapted to detecting the DSL and schools of fish feeding in it. He reports further in his paper:

"In the morning, when the sky wa gradually turning gray, the DSL bega to go down slowly at the rate of 2 to 30 meters per hour; and about sun rise the fish school formed above th DSL, which went down slowly an finally reached and disappeared at th sea bed within two or three hour after sunrise.

"In the daytime we could find man fish schools near the sea bottom; bu in the evening when the DSL bega to rise the fish schools also rose to ward the surface and dispersed abou sunset.

"We have observed the vertical dis tribution of ground fishes in three lay ers above the sea bed: at 0 to 2 me ters; 2 to 4 meters; and 4 to 10 me ters. We also found that in the sprin tides the fish are most numerous i the 4-10 meter layer; but during nea tide they are mainly in the lowest layer In this fishing ground there was known tendency for fishing to be les productive during the spring tides tha in the period of the neap tides, a phe nomenon well explained by our re sults".

Ultrasonic Sounding for Salmon

● High seas salmon fishing is ex clusively an enterprise of the Japan ese, and they have found means o increasing its effectiveness—and per haps expanding its scope to includ daytime as well as night fishing—b means of echo-sounders working a ultrasonic frequencies.

Dr. Hashimoto again pioneered th investigation which told the Japanese that the feeding salmon of the high

9 years of user experience proves . . .

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Nine years of use on all three coasts *proves* netting of Du Pont nylon can boost the profits on every catch you make, because it offers the economy of longer wear, fewer replacements and repairs.

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Besides the high strength and long life of Du Pont nylon, you get the high-quality workmanship of the most skilled net manufacturers . . . a combination that assures you of the finest netting available. Next time you buy netting, be sure you specify netting that means greater profit for you . . . netting of Du Pont nylon.

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Ocean Salmon Gillnetters of the Japanese fleet, the mainstay of that nation's high seas salmon fishery, are equipped with echo-sounders of special characteristics permitting them to determine the position of the Deep Scattering Layer and the degree to which salmon are feeding in it. They are equipped with radio, direction finders, sonar and super-sounders.

seas are associated with the DSL in vertical distribution; and that they move to the surface with the DSL during the night.

This, then, provided a factual explanation of the greater effectiveness of the high seas gillnets when fished at night. Fishermen generally have tended to associate the gillnet's nocturnal gain in efficiency with the lowered ability of the fish to see the web in the dark. While this may well have a part in producing the result, and may account for all of it in inshore waters where the salmon are migrating and not feeding, Dr. Hashimoto's demonstration provides definite evidence that feeding habits rather than eyesight is the governing consideration.

● In application of ultrasonic sounders to high seas salmon gillnetting tests were made with frequencies of 28 kc and 200 kc, using a "fish finder" with depth ranges of 50 to 100 meters, and with a high pulse rate of from 144 to 225 per minute.

During these studies it was found that the ultrasonic waves of the characteristics employed were absorbed by bubbles along the bottom of the boat. Salmon simply were not detected where the normal transducer installation on the hull was employed. This condition was corrected fully by installing the transducer on a vertical iron pipe, supported by brackets extending 27" from the side of the vessel, and with the transducer about 4.5' below the surface. This proved entirely successful in correcting the trouble and the search for fish could thereafter be carried out with the vessel running at its full speed of 10 knots.

In operation the frequency of 28 kc proved equally effective with that of 200 kc, but the 225 pulses per minute was superior to the 144 rate. Results with the fish finder set for 50 meters were better than when the range was twice that depth.

The Way of Salmon in the Sea

● Careful observations were made as to time of day at which the records were made, with these conclusions demonstrated:

1. "The salmon obviously concentrate in the DSL and move with it."

2. "Many of the salmon which were at 30 to 40 meters depth during the day moved to the surface after sunset".

3. "The rest of the salmon, however, remained in 30 to 50 meters depth all day. A new and effective method should be found to catch these fish as well".

4. Fishing in the DSL with sunken gillnets is possible. On an experimental basis Dr. Hashimoto caused such a net to be fished in the DSL at 20 to 30 meters. The catch was a surprising 11.2 fish per shackle—against a commercial average of 5 to 6 for normal fishing—and the salmon taken had their stomachs crammed with euphasids.

5. Catches of salmon were also made in experimental fishing in the DSL when it was at 200 meters depth.

It is reported in the official literature: "The average length of salmon caught during this experiment was about 50 cm. (20")". Species was not reported.

● It is interesting to note that Points 3 and 4 above confirm results reported by the Canadian researches conducted in 1957 for the International North Pacific Salmon Fisheries Commission, when exploratory gillnet fishing to trace the distribution of salmon in the Gulf of Alaska was successful in catching salmon in sunken gillnets, which sometimes took more salmon at 20-60 and 40-80 ft. levels than in surface gillnets fished at 0-20 ft. depth.

Use of Electronic Echo-Ranging Gear in Norway Herring Fishery

By
TORVALD S. GERHARDSEN

The Present Status, With an Indication Of the Future Trend

● Success of sonar in Norway's herring fisheries, the largest in the world, can clearly be attributed to (a) the pioneering work of fishery biologists, and (b) to the ability of the leading Norwegian manufacturer to adapt the design of equipment to the vessels and the catching technique used by the fleet.

About 1,000 sonar sets are now installed in Norway. The three principal types making up this figure are: the Simrad small boat sonar; the Simrad medium range sonar and the Simrad Skipper sonar. The "tactics" of sonar fishing now readily detect a herring shoal at 1,500 yds.

An indication of the future trend in sonar fishing is given by the specifications for sonar equipment as required by pioneering fishery research scientists.

Early History of Fish-Finding Sonar

● With the partial release in 1945-46 of the secret instruments for locating submarines, it was for the first time possible to fulfill an old dream among fishermen and fishery biologists: to locate concentrations of fish at a considerable distance away from the ship.

The new technique increased the searched area more than a hundred times, as compared to echo sounding survey.

In order to secure a catch, it was no longer necessary to wait for the shoals to surface, or to rely on the odd chance that the fish would come within the narrow vertical sound beam of the echo sounder.

The first systematic investigation as to the suitability of sonar equipment for detection of shoals of herring took place in February, 1946, when a Norwegian naval vessel with sonar equipment was put at the disposal of the Institute of Marine Research, Bergen, Norway. (Gerhardsen 1946.)

As a result of these very promising trials it was decided to have the new 170′ fishery research vessel M/S *G.O. Sars* equipped with sonar.

Norway's new fisheries research vessel **Johan Hjort**, mounting the most modern electronic equipment.

This vessel was commissioned in 1950, and since then the sonar equipment has been in use for more than 30,000 hours on various cruises in the Norwegian Sea.

There is no doubt that this sonar set immediately became an indispensable tool in the herring research program, which in the course of a few years has led to a much wider comprehension of the behavior of the Norwegian-Icelandic herring stock. (Devold, 1951.)

The success with the sonar set in the *G.O. Sars* must of course largely be attributed to brilliant scientific leadership of the research program and skillful operating of the equipment. There was, however, no doubt among the scientists and engineers connected with fisheries and sonar research that a properly designed sonar set would be of great value, even to ordinary fishing craft.

Following a suggestion by Dr. F. Devold, a high power sonar set specially designed for fishing vessels was developed and tested at sea in 1953 by the Norwegian Defense Research Establishment. (Gerhardsen, 1954.)

At the same time a medium range sonar set was developed by Simonsen Radio A/S, Oslo ("Simrad") as an extension of the company's line of modern echo sounders. The company also secured production rights to the high power sonar set.

During the last five years the number of Sonar installations has steadily increased, and by the end of 1959 probably more than 1,000 sets will be in operation in the Norwegian-Icelandic area alone.

Natural Resources

● When studying the introduction of a new electronic aid in a specific fishery, it is, generally speaking, important to have a clear understanding of the whole trade, i.e. the more significant facts about the stock, the vessels, the catching technique and the economy of the fleet.

Fishery biologists have—with due reservations — estimated that the strength of the Norwegian-Icelandic Herring Stock is at least 10,000,000 metric tons, to the author's knowledge the largest in the world.

In the best years a catch of nearly 2,000,000 tons has been landed, with-

NOTE—Mr. Gerhardsen is Chief Engineer of Simonsen & Mustad A/S, Horten, Norway, the Sonar Department of Simonsen Radio A/S, Oslo.

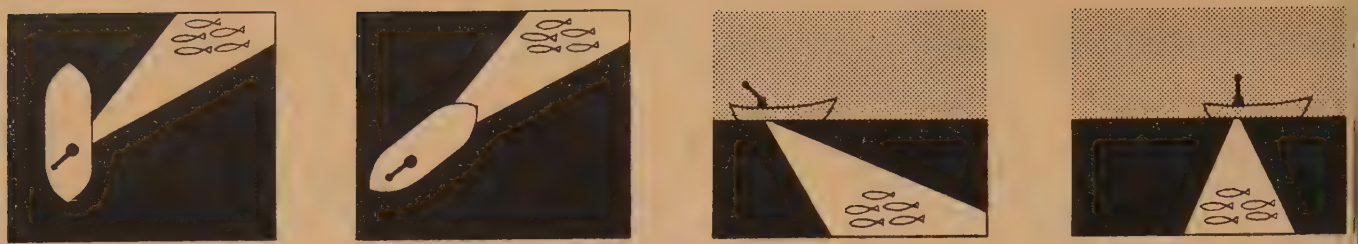


Figure 4—Small Boat Sonar Tactics

Above, left—A school of fish is recorded. The joystick, which always points in the direction of the sound beam, shows where it is. The recording unit and the scale on the hull unit indicates depth and range.

Right above—The boat is turned toward the school, while the transducer is trained until the joystick is pointing straight forward.

Left above—As the school is approached, the beam may be trained to find the outside limits of the school, showing its size; and the small boat may circle the school, looking at it from all angles.

Right above—Or the skiff may pass over it. The joystick will then point straight down and the sonar will serve as an echo sounder.

out measurable diminution of the stock.

The home and feeding ground of this herring stock is the southern part of the vast basin of the Norwegian Sea.

During the summer months from June to September the herring is found in pursuit of food north of Iceland, where good catches have been taken for nearly 100 years, mostly by Icelandic and Norwegian vessels.

One of the problems in the catching technique is that the herring shoals will normally only surface during a few hours in a 24-hour period. (Jacobsson, 1957.)

With the poor visibility in foggy and foul weather it is easily understood that the skipper's visual chance observation of the surfacing blue backs of herrings has been a most unsatisfactory means of locating the shoals.

Recordings on echo sounder with its limited search area is at best haphazard when searching a vast ocean.

It is, therefore, not surprising that the extensive use of sonar sets started in this area, where several hundred sets are now in operation every season.

During the winter months the herring concentrate in huge shoals and start on their spawning migration to the banks on the West Coast of Norway. The herring fisheries in the coastal waters of Norway, which can be traced back to the days of the early settlements, take place in the period from January to April. At this time of the year it is not unusual for the fleet to be hampered by extremely adverse weather conditions, keeping a fleet of some 2,000 vessels idle in harbor for weeks at a time. The traditional catching technique where the purse seiners use a mothership with the net carried in two 30′ dories, is partly responsible for this dependence on fair weather.

The fishing master commands the operation of shooting and handling the net from an 18′ high powered dinghy, equipped with an echo sounder.

Since speed and precision is of vital importance during the whole operation, and the herring does not surface, it has proved highly successful for the master to supplement his echo sounder with a miniature sonar set, in order to locate the shoal accurately and direct the dories accordingly.

In the past there has been a natural, but nevertheless rather unfortunate tendency for the fleet to focus on a narrow area where a catch has already been made.

With the introduction of high power sonar on many of the mother ships, the skippers find it advantageous to search independently for shoals at catchable depth.

During the period between these two great traditional herring fisheries (north of Iceland in June-September and in Norwegian coastal water January to April), the herring is found in the open sea.

Through the pioneering work by fishery biologists (Devold, 1951), the introduction of high power sonar with a search radius of approximately one nautical mile has opened an entirely new, profitable pelagic herring fishery in the Norwegian Sea.

It may be difficult to find a more striking example of the wide reaching changes thus brought about by a new electronic aid in a traditional age old trade.

Sonar Equipment in Herring Fleet

● The great interest in sonar as reflected by the installation figures in this area does not of course imply that the Viking descendants have any particular sense for gadgets. The simple explanation is that the natural conditions for the successful use of sonar are present, and that suitable equipment was made available to the fishermen when it was needed.

The result may also be attributed to the systematic and sincere way in which the whole enterprise was launched.

With a few exceptions the fishermen's interest in sonar has not been boosted by unrealistic advertisements and high pressure salesmanship.

From the very beginning the fleet has been presented with a choice of instruments to suit their economy and the nature and intensity of their fishing effort.

The leading manufacturer—Simonsen Radio A/S—has deemed it expedient only to market equipment whose operational value had already been ascertained by extensive sea trials carried out during actual fishing expeditions in all theatres of operation.

Such precautions, while always desirable, are of the utmost importance when dealing with a trade where the margin between profit and loss is in the last instance entirely dependent on the forces of nature.

Principles of Operation

● Underwater detection by echo ranging technique is known by the British (and Continental) term *"Asdic"* and the American term *"Sonar."*

The basic principles of echo ranging may be well known, but for the sake of completeness the following generalized description of the main components is given:

A *searchlight* (as opposed to a *scanning*) sonar set employs a directional transducer to transmit and receive sound waves. High power pulses are generated in a tube transmitter. The received signals (echoes) are amplified in a superheterodyne receiver and presented on a graphical recorder and reproduced through a loudspeaker and headphones.

Echoes are recorded on a moving strip of sensitive paper by a motor driven stylus travelling at uniform speed across the paper along a calibrated range (or depth) scale.

When lowered to its working position, the sonar transducer may be trained to any desired bearing in accordance with the desired search program.

Briefly, the sequence of events is as follows:

The transmitter is keyed, and a

pulse of sound energy emitted each time the stylus passes the zero mark on the range scale. As the sound waves travel outwards from the transducer and back again from a reflecting object, the stylus moves along the range scale.

On return of the echo, the amplified signal is fed to the stylus, leaving a mark on the paper, and thus indicating the range of the target.

By observing the transducer bearing on the bearing repeater and reading off the recorded range, the essential information of range and bearing is known.

It is outside the scope of this article to describe technical details of specific types of equipment. The following survey will be restricted to a general presentation of some of the most popular models of sonar that are now in extensive use at sea.

The bulk of installations up to the present date, totalling about 1,000 sets, is made up of three main types:

Simrad Small Boat Sonar—mostly for small, open boats.

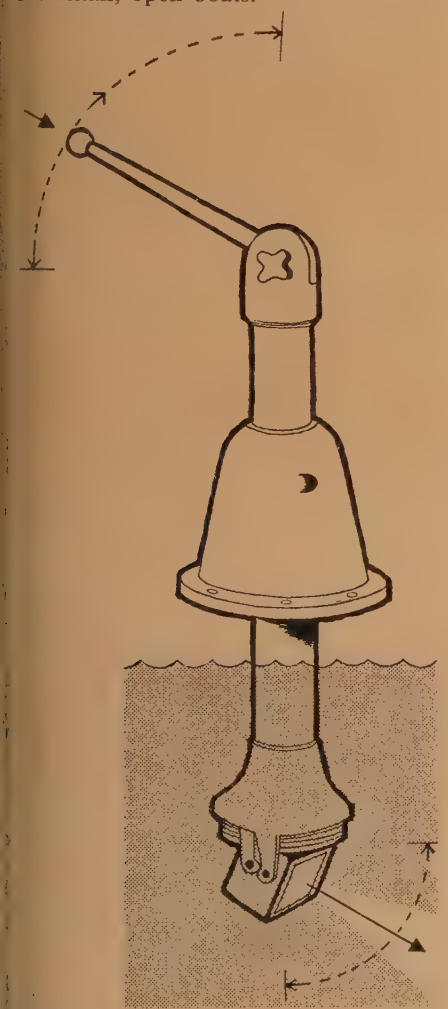


Figure 2—
Sketch of the Simrad small boat sonar hull unit. The joystick always points in the direction of the sound beam. Underwater housing removed to show transducer.

Simrad Medium Range Sonar—for 40-80′ vessels.

Simrad Skipper Sonar—high power set for ocean-going vessels 60-150′.

Although primarily designed to perform specific tasks under the arduous conditions in the Norwegian-Icelandic herring fleet, these models have also proved to work admirably in many other parts of the world.

The Small Boat Sonar

● This Simrad set is a combined sonar echo sounder installation, specially designed for the small 18′ open boats used by the fishing master when directing the shooting and handling of the purse seine.

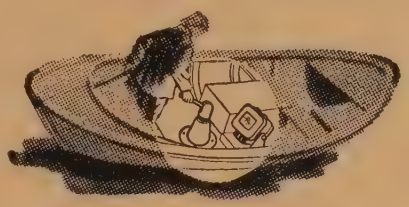


Figure 1—
Installation of a Simrad small boat sonar in an 18′ skiff or dinghy.

In this particular application of sonar, rapid scanning and the ability to keep contact with the shoals at close range is of prime importance. This is provided for by a simple joystick operation, and by the high pulse repetition rate of the recording unit.

The hull unit is manually operated by means of a joystick with complete freedom for 360° training and 90° depression of the beam.

The joystick is always pointing in the direction of the sound beam.

These small 18′ boats are naturally undergoing violent motions which complicate sonar operations. The simple form of stabilizing movement imposed automatically when operating the joystick has proved to reduce this drawback to a remarkable degree.

By putting the joystick up in a vertical position, the set will work as an echo sounder. The fact that the transducer can be kept about two feet below the keel, also during sounding operations, has to a large extent eliminated the troublesome aeration often encountered with small boat sounders.

The electronic unit and the dry paper recorder are mounted in a self-contained watertight cabinet with cradle suspension for easy installation, and for adjustment of the viewing position. The extra precaution of complete watertightness is deemed necessary to achieve the desired reliability under these extraordinary service conditions where rough handling, salt spray and even occasional submergence is a frequent occurence.

Figure 3—
Recording unit of the Simrad small boat sonar.

The normal range* of this small boat sonar equipment is about 500 yds., and somewhat more when sounding.

With an extension of the mechanical training and tilt gear this equipment is also available for larger vessels.

Medium Range Sonar

● Simrad's medium range unit is believed to be the first type of sonar set for civilian use to be produced in quantity. Particularly in the Icelandic herring fleet this type of equipment has been installed in large numbers, and several hundreds are now in use during the summer herring season.

This is also the set favored by fishery authorities in their smaller research vessels.

The set was designed to meet a very definite demand for a low priced set to suit medium size vessels (40 to 80'). Being based on a modern echo sounder with "white line" features, the medium range sonar has gained widespread popularity also in the fleet, taking part both in the pelagic herring fishery and in various other fishing activities where pure echo sounding is of prime importance.

For these vessels the capital expenditure involved in buying a sonar set solely for the herring season has not seemed justified until recently.

When first introduced, the sonar part of this set was intended as a supplement to the company's line of modern sounders. In fact many skippers already in possession of a modern Simrad sounder have ordered the sonar hull unit only, and by a minor field change to the electronic and recording units the special sonar features

*The effective range of sonar equipment is generally subject to large variations, due to changing water conditions, sea state, size of target, the operator's skill. Normal range will thus mean what is on the whole most frequently observed during practical use at sea.

Figure 5—
Medium range Simrad sonar in a unit designed to combine the sonar function with a "white line" echo sounder.

have been incorporated.

A complete installation consists of two units:

The hull unit, whereby the sonar transducer can be raised and lowered and rotated in the horizontal plane, and

The control cabinet, containing the electronic unit and the graphical recorder utilizing wet paper for increased dynamic range.

In the design of the hull unit special attention has been paid to the severe restrictions on space in the smaller types of wooden fishing vessels.

In order to reduce the piercing of the hull to a hole of approximately 3" dia., the transducer is in most cases housed in an outboard blister when not in use. The raise/lower- and training movements are by mechanical remote cnotrol from a bridge position adjacent to the control cabinet.

When switching over from echo sounder to sonar, the pulse length of the tube transmitter, the characteristics of the amplifier and the speed of the graphical recorder are automatically altered to suit the sonar application.

The range of the medium range sonar is 800-1,000 yds. and about 1,000 fathoms when used as a sounder in connection with a modern high gain, high resolution transducer.

High-Power "Skipper" Sonar

● In the years following the publishing in 1953 of the report on the prototype of a high power sonar set for large fishing vessels, several makes and models have been marketed.

Not all of these have been equally successful.

The Simrad Skipper sonar may, however, serve as an example of the standard achieved by a competent company, having the invaluable advantage of close contact with an active and outspoken population of fishermen.

The inspiring criticism from the practical user himself through all stages of development and design is of the greatest value to designers and engineers. The design of the Simrad Skipper sonar is thus based on the accumulated practical experience by scientists and fishermen, supplemented by the manufacturer's own experience from several hundred installations of similar types of equipment.

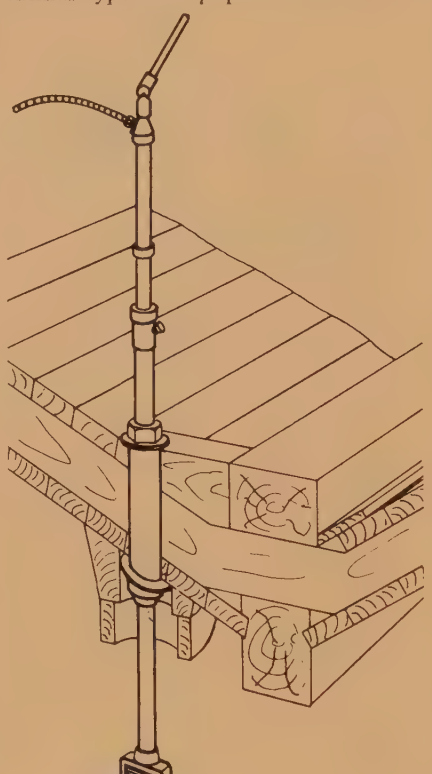


Figure 6—
Sketch showing medium range sonar hull unit installation with hull-piercing hole only 3" in diameter.

The line of approach in the design has been to concentrate on the pure detecting capabilities, bearing in mind that initial detection undoubtedly is one of the most difficult problems for the pelagic fishery.

A further paramount requirement has been that of simplicity, based on the firm belief that simplicity is the mother of reliability, which can hardly be overstressed in equipment of this kind.

The set consists of two units:

The hull unit, with electrical remote control of the raise/lower- as well as of the training movement. The high gain transducer with variable polar diagram is connected through slip rings giving complete freedom of operation on all bearings.

All electrical components are sealed in splash-proof and watertight compartments.

The control cabinet, is designed to be operated from a sitting or standing position at the operator's choice. The cabinet houses the high power pulse transmitter with a range of pulse lengths, the sensitive superheterodyne receiver with special signal processing circuits and output stages for listening and recording, the graphical recorder and, finally, all the necessary controls and repeaters for starting, stopping and maneuvering the set.

The scanning is either manual or automatic in accordance with a pre-arranged program designed to ensure optimum coverage of the swept area. The working range is given as 2,000 yds., and allowance has been made for recording and listening to echoes at twice this distance.

During a normal search the ship is sweeping a lane extending one mile to either side, i.e. the swept area will have a width of approximately two miles.

When used as a sounder the scale of the recorder and the characteristics of the electronic unit are automatically altered. Regular soundings at 1,000-1,500 fathoms—although of little use to the fishermen—can be obtained.

With the introduction of the Skipper sonar, having a figure of merit well in excess of that of many existing naval installations, a powerful and fascinating new tool has been made available to the ocean-going fleet.

It has been prophesied that the introduction of equipment of this kind may offer new economic possibilities to fishermen in many parts of the world engaged in the hunting of species with a typical shoaling (schooling) behavior, and may even open en-

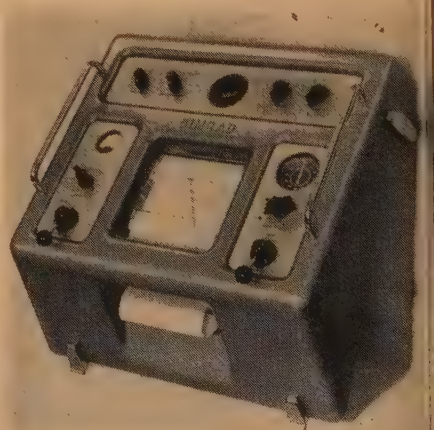


Figure 7—
Control cabinet of the Simrad Skipper sonar, which combines all functions of this powerful equipment in one single compact unit.

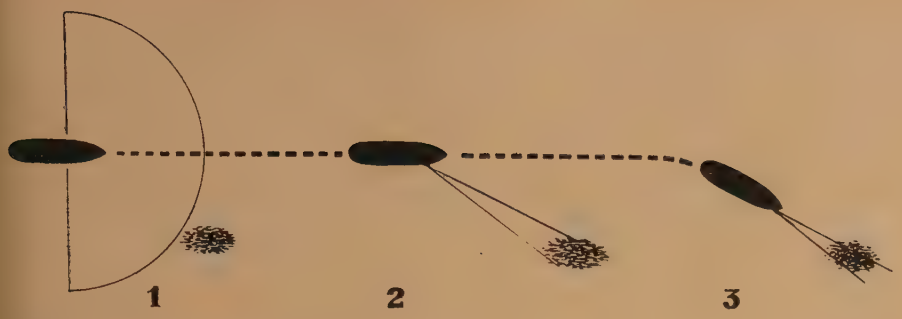


Figure 8—
Sketch illustrating the tactics of sonar fishing with a medium range unit.

tirely new ways of profitable exploration of the resources of the sea. However this may be, in the Norwegian-Icelandic fleet at any rate there is little doubt that this searching aid, together with a further development of the pelagic trawl over the years may bring about a wide-reaching change in the catching technique which at present mostly depend on traditional gear and methods.

Tactics of Sonar Fishing

● The following sonar operating procedure is taken from a paper by G. Vestnes, presented at the FAO conference on fishing gear in Hamburg, 1957.

"The normal operating procedure is to train the transducer from port to starboard in a stepwise manner, and to listen for echoes between each transmission.

"When an echo is heard or recorded on the range recorder, the first requirement is to classify the target. Since echoes may be obtained from aerated water, crest of waves, shoals of squid etc., the question of classification is an important one if valuable time is not to be lost by investigating "false" echoes.

"Experience has shown that a well trained operator can to a certain extent distinguish between echoes from herring shoals and echoes from other targets by listening to the quality of the sound of echoes, as presented to him in the headphones or loudspeaker. This procedure, however, is not infallible, and it has been found advantageous at certain intervals to classify the sonar target by echo sounder."

The sketch (Fig. 8) may serve to illustrate the point.

At one the ship is searching, using automatic training mechanism and covering a lane of some two miles width.

In position two a shoal has been located, and the sound beam is kept on the target.

At three the ship has altered course and is approaching the shoal for further investigation, and will eventually run over it using the echo sounder for final classification and estimation of its size.

Since the herring is easily scared, it is often inadvisable to run over the shoal with the mothership. Experience has shown that for purse seiners using net carrying dories the best procedure is to stop at a distance of, say, 500 yds. and guide the fishing master's dinghy to the vicinity of the shoal. When his small boat sonar is brought to bear on the shoal, the master will direct the operation of shooting the net.

With other gear the mothership may circle the shoal as the net is shot from the stern.

As the shoal is approached, the succession of echoes will form a sloping line on the moving band of sensitive paper on the graphical recorder.

The reproduction of an actual recording on Fig. 9 may give an indication of what actually takes place. It shows echoes from shoals of winter herring off the Norwegian coast.

While approaching the first shoal (bottom) from a range of 1,300 meters, a second shoal (top) appeared on the same bearing. On a separate echo sounding recording of the first shoal, it was found to be too deep to be caught by purse seine.

The skipper then proceeded to the second shoal, which proved to be at catchable depth.

For readers not familiar with this type of presentation it should be pointed out that *the length of the two sloping echo traces on the graph has no connection with the size of the herring concentration,* but indicates that the sound beam was kept on the target for a considerable period, as the shoal was slowly approached.

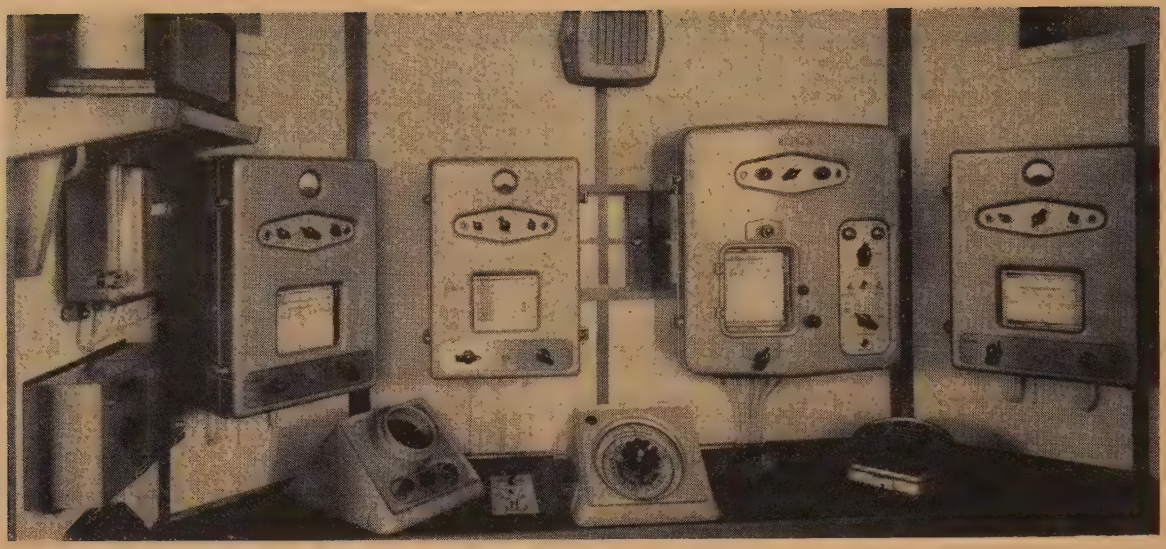
The graph is formed as a motor driven recording stylus travelling across the moving strip of sensitive paper, leaving a bluish-brown mark as the transmitter is keyed ("zero" mark at left hand edge of the graph), and a second mark (echo) as the echo is received.

Since the recording paper is moving, a second traverse of the stylus will leave a zero mark and an echo above the preceding one.

If, in the meantime, the ship has come closer to the shoal, the second echo will of course appear at a shorter distance—i.e. closer to the zero mark, the succession of echoes thus forming the trace.

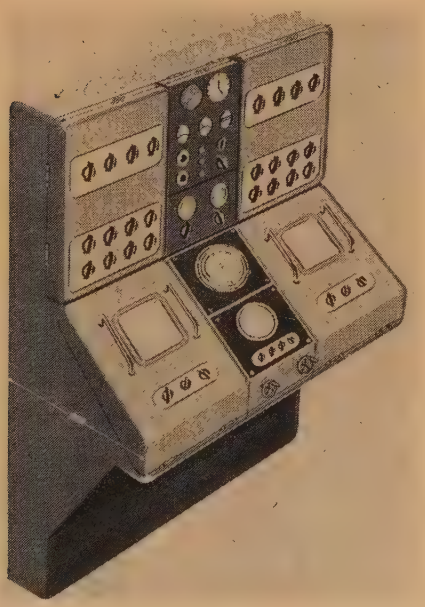
Experience has shown that the operation of the set is easily learned by the average fisherman, but the inter-

Figure 9—
Reproduction of an actual sonar recording of winter herring schools, with sketch below showing how they were fished, the vessel going on from the too-deep school to make its catch from the second school detected.



"Search Room" of the **Johan Hjort,** showing Simrad instruments, including research sonar and three sounders. (Two others are mounted elsewhere in the vessel.) — Photo courtesy Institute of Marine Research, Fisheries Directorate, Bergen, Norway.

pretation of echo traces will naturally require some skill and experience before maximum utilization of the equipment is achieved. Particularly the classification of targets may be difficult in the beginning.



Simrad research sonar, an artist's impression of development of the operator's control console.

It has, however, in many instances been fascinating to watch the ease with which fishermen have adopted sonar and included it among their other instruments, i.e. radio telephone, direction finder and radar.

The question of proper instruction should nevertheless not be overlooked, but it hardly represents any serious problem with well designed gear where simplicity, reliability and ease of maintenance and operation are engineered into the equipment.

Research Sonar and Future Trend

● The pioneering work by fishery biologists in using sonar for herring location is already commented on.

The research vessel M/S *Johan Hjort,* which was commissioned in 1958, may serve as an example of extensive acoustical sounding and sonar gear required by a modern research vessel with engagements in many theatres of operation in the vast Norwegian Sea.

All of this equipment, i.e. three echo sounders and one sonar set, is kept running simultaneously. This has, of course, only been possible by a careful choice of working frequencies for the various installations, and by taking special steps to suppress mutual interference.

Regarding sonar equipment, the only choice for research vessels has until recently been either equipment designed for fishing vessels or obsolete military equipment made available through government authorities.

The Institute of Marine Research, Fisheries' Directorate, Bergen, Norway, has for some time been fully aware of this unsatisfactory situation, and has now ordered new research sonar sets to be specially made for their ocean-going research vessels.

● The Simrad research sonar sets will include the latest and most refined technique for echo detection and signal processing, and with the extra space which can be made available in a research vessel, it has been possible to allow for a substantial increase in the working range and for a refined scanning technique, giving better coverage of the swept area.

With the high gain transducers with variable polar diagrams, together with new electronic circuits and advanced design of graphical recorders and oscilloscope display, this is expected to be a scientific tool with remarkable features.

The whole installation, comprising two sonar sets and 3-4 echo sounders, will be manned by a single operator on a normal watch.

Equipment of this kind is of course for the time being far outside the research of the small boat fisherman.

With the rapid advances in technology now taking place, it is, however, not at all impossible that today's refined scientific tool will be tomorrow's bread-and-butter instrument for the practical fisherman.

Another Norwegian Feature Next Month

● First-class editorial copy for this special number on "Electronics in Fishing" became available beyond the scope of our space, forcing us regretfully to postpone publication of a number of articles until future issues.

Among these articles which had to be omitted from this issue is one on the use of the "white-line" echo sounder in the location of fish, written by Ralph Eide, chief engineer of Simonsen Radio A/S, Norway, a confrere of Mr. Gerhardsen, author of the present article on echo-ranging in the Norwegian herring fishery.

Mr. Eide's article will be published in the October issue of **Pacific Fisherman.**

PACIFIC Fisherman's NEWS

SEPTEMBER 1959

Electronics' Most Promising Market—

The Thousands of Small Modern Fishing Vessels

● Progressive electronics manufacturers today are designing equipment to fit the needs of fishermen, and to fit their *boats* as well, perhaps small ones.

One of the great facts of fisheries today is that, while there is of course a demand for gigantic tuna clippers and trawlers, there is also a strong trend toward relatively small boats with high earning power per dollar invested, versatile craft, highly mechanized, with small crews.

The trend is partly economic, partly technological, and the sharp observer knows relatively small boats are economically profitable today because of applied science and technology — electronic equipment outstanding among the rest.

With today's modern electronic instruments small fishing vessels can compete with big ones, and perhaps earn more per man-share. Along with their specialized radiophones, direction finders, radar, loran, echo-sounders and automatic helms, these modern craft of moderate size are heirs also to the savings in cost and space and effort which come from synthetic nets, power blocks, and chilled seawater refrigeration.

● There was a day when radiophones, radio direction finders, echo-sounders, radar, loran and such equipment were manufactured primarily for naval and large merchant vessels. Fishermen, even big fishermen, couldn't afford them.

But eventually manufacturers came to realize that fishing vessels are numerous, and that for them electronic equipment could be a working tool, meaning something much more in an economic way than strictly an aid in safe, fast navigation.

With that realization electronic gear became a commonplace in the fisheries, for the manufacturers began to produce equipment of size suitable for fishing vessels and, in some instances, with capabilities capable of contributing to the fisherman's earning ability as well as his safety.

Instrumentation for Grown-up Small Boats Effective

● Now a third step brings the radiophone, the direction finder, the echo sounder, the radar, the loran, and even the sonar within the range and reach of the small fisherman, the troller, the gillnetter, the crabber, the jitney seiner, the boat used by the tuna clipper for making bait.

The units are small and relatively inexpensive — but the field is enormous, running on the Pacific Coast into thousands of boats. Thousands? Surely, for there are 7,000 *trollers alone*—and everyone of them has, or *needs,* a radiophone, echo-sounder and direction finder. The boat could use more instruments as well, but these are almost as necessary as his compass to the ocean salmon fisherman.

● The small fishing vessel market is proving attractive to many manufacturers, and some are concentrating upon it. Again, some of the largest builders of equipment find in the units for the small fishermen whose boats may range from 30 to 60' market volume which is truly attractive.

As an example, Bendix-Marine recently introduced two new depth recorders in a size class specially suitable for the small coastal fisherman. One

"We are at the Beginning of an Era"

● Virtually this entire issue of *Pacific Fisherman* is being devoted to the subject of "Electronics in Fishing" because of the growing importance which fishermen are finding in the applications of science to the practical aspects of their calling, one of the oldest means by which man has earned his living.

The subject is a fascinating one, which ever grows more fascinating; and perhaps we now are barely looking beyond the beginnings.

Commenting on this point, L. S. Bradbury, director, Industrial Development Service, Canadian Department of Fisheries says in ringing tones:

"We appear to be just at the beginning of an era which will give birth to fish finding and catching techniques hitherto undreamed of."

When the progress which has been made in the 12 or 14 years since peace released the new electronics to serve fishing is measured, the beginning of the era is fair indeed.

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PACIFIC FISHERMAN'S NEWS

SEPTEMBER 1959 Volume 57 Number 10

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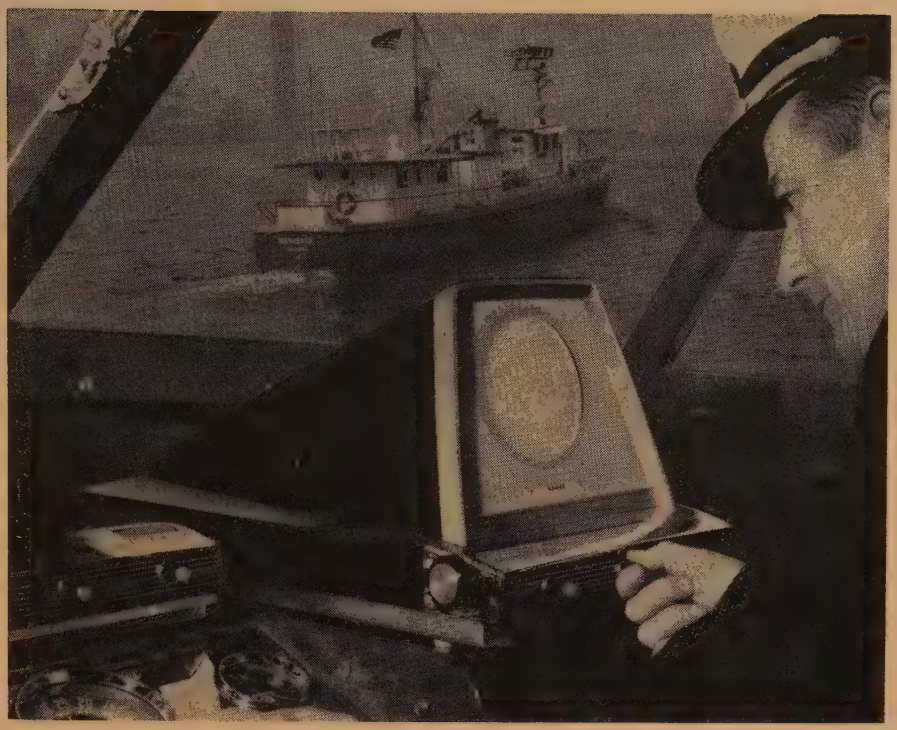


Compactness without sacrifice of effectiveness and ruggedness is evident in electronic gear specially designed for modern fishermen. Here the skipper adjusts the new Sperry portable radar. On the extreme left is the new Sperry rdf., no bigger than a brief case.

has three scales, with a total range of 60 fathoms; and the other five in a range of 50 fathoms.

This makes for easy-to-read bottom contours, as the full range of the instruments is divided into narrow bands characterized by e x t r e m e clarity. These sounders have a transistor power supply built-in, which eliminates vibrator trouble. They are available for 12 or 32 volts, which is within the capability of almost any fishing craft.

● Possibilities latent in the small fishing vessel market are stated crisply by E. B. Stevenson of S & T Sales, Ltd., distributors for equipment built by Spilsbury & Tindall, Ltd., Vancouver, B. C. Mr. Stevenson writes:

"Developments have made it possible for the smallest vessel with only a battery power supply to be properly equipped with radiotelephone. Not only are such vessels able to communicate with each other for safety, for weather or fishing advice; but they are always available from shore, which is of the utmost importance in the organization of a fishing fleet.

"Today echo sounding equipment is available to every vessel, and at extremely reasonable price.

"Two years ago, following the trend of the apparent needs of the British Columbia fishing industry, Spilsbury & Tindall developed a small boat radar, which gives all the information supplied by bigger and more elaborate units, and in size which can be accommodated in even the smallest vessel. Ingenious use of hand-controlled scanners and a combination of azimuth indicator and distance indication have cut the current drain to the point where 12-volt operation of radar is now a very practical thing. These radars have been installed on many B. C. fishing vessels, ranging from small gillnetters to large seine boats.

Electronics are Right Arm Of the Small Fisherman

● Where fishermen work alone, or perhaps with only two in the crew, simple automatic auxiliary devices broaden the benefit from electronic equipment. A case in point is the Channelgard, manufactured by Sesco, Inc., for fishermen in a fishermen's haven, Friday Harbor, Wash., where the needs of the small fishing vessel are intimately known to the electronics technologist.

Channelgard works with any radiotelephone, and regardless of the channel to which it is tuned guards the Calling and Distress Channel at all times. The troller at work in the cockpit, or the gillnetter at his roller, turns the task of monitoring his R/T over to the compact little auxiliary instrument.

Trollers and gillnetters, and particularly tuna bait fishermen who must work close to reefs and rocks, find marked benefit in sounders equipped to give alarm when water depth is registered less than a selected mark.

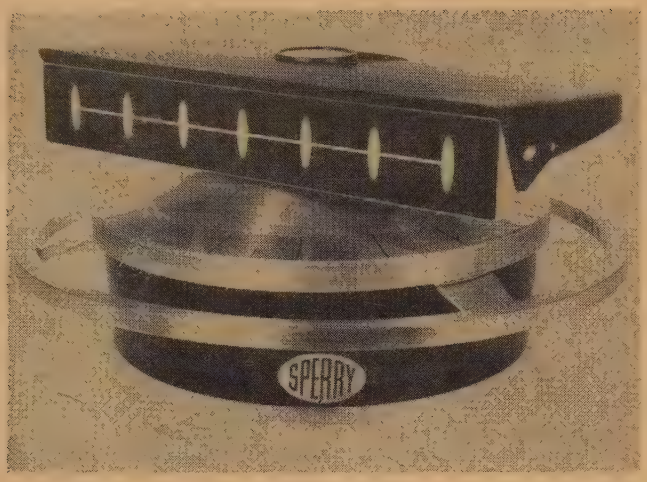
Thus the troller may want to keep in water deeper than 120′, where he has his gear fishing. The bottom is rocky, and if his gear strikes it may be lost. So he sets his Sonar Depth Alarm sounder to warn him if the vessel enters water shallower than 140′. He goes on with his fishing, safe in the knowledge that his Sonar depth indicator will warn him of shoaling. When the sounder gives its alarm, loud and clear, he touches his throttle, boat speed picks up, the gear clears the bottom until he can head into deeper water or shorten his lines.

The Sonar depth alarm, by the way, is manufactured by the Sonar Radio Corporation of New York. The depth alarm and other instruments manufactured by the company should not be confused with the type of underwater sound ranging equipment often called sonar or asdic.

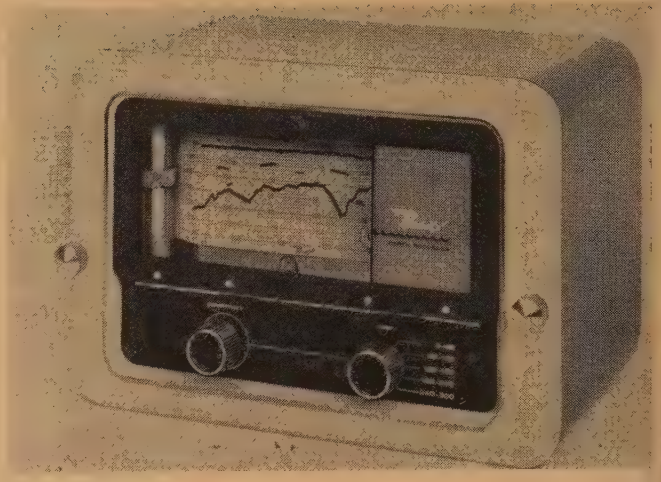
The Sonar Radio Corporation manufactures a number of such items designed to provide special service for fishermen. They have a depth indicator which is identical with the alarm type, except for that feature. Another unit specially designed for the small fishing craft is the Sonar portable direction finder operating on an energizer-type battery with 4,000 hours of working life.

Specialized Radiotelephone Communication Equipment

● Special requirements of the Pacific



New Look in Scanners is exemplified by this Sperry radar antenna. Indeed most electronic equipment for smaller fishing vessels is marked by its modern design.



Portable Sounder produced by Bendix with transistorized circuits and circle-sweep stylus can be transferred to any location about the vessel, or into a seine skiff.

fishermen must have been kept foremost in the minds of the engineers and designers of Kaar Engineering Corporation of Palo Alto, Calif., for the line of radiotelephones and other electronic instruments bearing the Kaar mark.

In great tuna clipper and tuna seiners, in trawlers and salmon seiners the length of the Pacific coast Kaar finds opportunity to serve fishermen with a degree of ruggedness and specialization which counts such points as the tuna seining skipper's need for communications on the fishing bridge while the radiotelephone itself is located in full protection in the radio room.

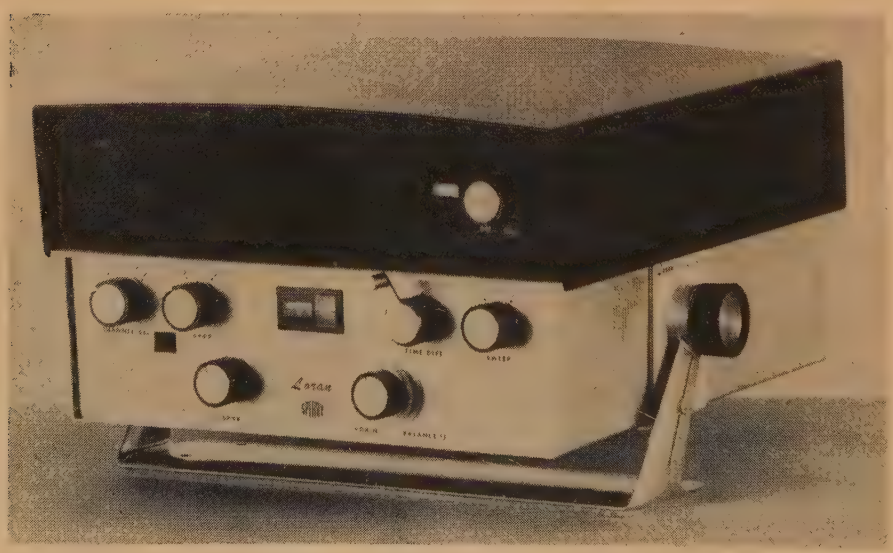
Ruggedness of fishing service was kept in mind in designing the Kaar direction finder, and the necessity for a remote loop above steel-hulled vessels, as tuna clippers usually are today. Moreover, the Kaar integral loop unit puts the compass rose in vertical position on the face of the set right alongside the tuning panel, where a skipper can see it while keeping his other eye on the tail skiff.

● The sweeping trend toward development of competent but compact, effective but economical, electronic equipment for the small boat fishing fleet with its thousands upon thousands of hulls is nowhere more plainly manifest than in the case of Sperry, which this year introduced a line of equipment within the price range of the troller, trawler, seiner or crabber, while also meeting the physical range requirements of his fishing.

The long-demonstrated abilities of the Sperry magnetic compass pilot are available to the small-craft fisherman today with no sacrifice of capability.

Sperry has its Radar 10, newly designed for the requirements of the big fisherman, with range running from 25 yards to 20 miles, with range scales of .5, 1, 2, 4, 8 and 20 miles. If you're a coastal waters fisherman, with a small boat the Radar 5 Sperry may well serve all your needs. On its 5" plan position indicator it covers a range from 50 yards minimum to five miles in two scales for close-in navigation or safety off-shore. The whole instrument involves only two compact units. Sperry bills it as the smallest marine radar anywhere available.

The same claim to superlative compactness, with no sacrifice of accuracy and ability, is made for the 38-lb. loran, requiring less than 2 cu. ft. of space, and available to fishermen at a level of cost which makes the search for wartime surplus instruments an extravagance which is usually unproductive and never truly satisfactory by today's modern measure of loran performance.



Loran comes compact today. Here is the newest version of the Sperry loran, specially designed to meet the requirements of range and ruggedness, as well as compactness and simplicity of installation, required in the smaller fishing vessels which make up the vast numerical majority of the fishing fleets.

The Cult of Compactness

● The cult of compactness extends through much modern design in the field of Electronics in Fishing. Boats are relatively small, and being workingmen the pilothouses are limited in space. There's a call for compactness, but it must not be reached through sacrifice of modern line and full function.

Sperry's new all-transistorized radio direction finder is a case in point. It is flat, highly sensitive, entirely portable, battery operated, with three-band reception from short wave, marine broadcast, Coast Guard and aviation beacon bands, providing fully for dependable navigation. The new Sperry r.d.f. is served by a ferrite antenna and a large rotating compass rose.

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250-hp Enterprise diesel of M. V. Stanford is kept spotless by chief engineer Kruno Gamulin (above), shown starting engine's priming pumps. RPM DELO Oil is also used in 671 GMC diesel auxiliary which powers reefer units. Reefer capacity is 100 tons of tuna or 140 tons of sardines.

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Whale Killers of the Japanese type are supplied even to the Norwegians. In addition to radio communications, radar, direction finders and echo-sounders, these vessels also are equipped with special long-range sonar or asdic gear which enables them to follow their quarry during its dive, and thus to be close upon him when he surfaces.

Aiming Electronic Answers

To Meet the Needs of Fishermen

● Japan, the greatest fishing nation in the world, makes extensive and effective use of electronics in its fishing.

It would of course be far too much to say that Japan is the greatest fishing nation of the world because of her employment of electronics, for she held that rank long before fishermen anywhere dreamed of sounding instantly by echo or of relying on Loran for location with precision and accuracy of the highest order.

However, Japanese fishermen were quick to sense the remarkable advantages latent in electronics.

Moreover, they intelligently analyzed how such instruments could help them, the characteristics and capabilities required.

Finally—and this is most important—Japanese manufacturers perceived in their national fishing industry a market potential of important volume; and set out to satisfy it.

● In Japan much of the electronic equipment employed by the fishermen was designed and built primarily with the needs of the fisherman in mind.

There are instruments for fishermen, and instruments for navigators. There are sounders into which are built the abilities the fishermen require; and sounders for deep water mariners.

This is true of other nations also—but it is particularly true of Japan, where fishing is a dominant element in employment and the national economy.

Japanese fishing methods in a number of instances differ from those employed in many of the industrial fisheries of the world, and the Japanese electronics manufacturers have developed instruments to serve these specialized forms of gear and fishing.

Tuna long-lining for example: served by sounders sufficiently sensitive to show the Deep Scattering Layer, and to mark the position of the long-line in it, as well as whether the fish sought are in the DSL; and whether the fish in the layer are of the size and type sought.

The specific instrument designed for this service by Kaijo Denki Kabushiki Kaisha, one of the great electronics specialists engaged in research, development and distribution for Nippon Denki K.K., is known as the "fish graph super."

The company also specialized in a "fish detector for trawling" which employs the "white line" method of differentiating between the sea bottom and fish schooled close above it.

This firm's development of sonar is termed the "fish mirror," and has two primary aspects of development so far as marine fisheries are concerned. The earlier and smaller of these is largely employed in purse seining, where it detects the schools of fish beneath the surface, determining their depths and densities over 110° of horizontal arc and 90° vertically.

A much larger type of "fish mirror"

the man from G.P. is here . . .
To be sure your boat is ready when the salmon start running, do what so many smart salmon skippers do. Call the man from G.P. **He knows marine engines.** He is trained to solve difficult and costly lubrication problems.
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is built specifically for whaling, where it is employed by the killer boats to track individual whales during their dives, thus enabling the killer boat to be close upon the whale when it rises to blow.

● Automatic direction finders are instruments of wide use in the Japanese fisheries, and they have been developed to a high degree of efficiency there. Taiyo Musen K.K. is one of the leading firms in this field, in which it has both the automatic and cathode tube types of d.f. instruments.

The Taiyo Musen "fish finder" is an ultra-sensitive sounder with the ability readily to detect the Deep Scattering Layer and the fish in it. In particular this firm's instruments are reported by Koreaki Takahashi, its managing director, to be successful in identifying salmon in the DSL, as described elsewhere in this issue by Dr. Tomiju Hashimoto, the great Japanese specialist in this field.

Facsimile transmission and reception which provides weather maps and oceanographic data for fishermen is another feature of this company's electronic instruments which is widely employed by Japanese vessels, particularly those engaged in tuna long-lining, which may be working in distant parts of the world, but which nevertheless are able daily to receive weather and ocean data from Japan.

The Kanagawa fisheries laboratory at Misaki, one of Japan's premier tuna-ports, specializes in the collection and world-wide dissemination of tuna fishing information to the Japanese tuna fleets. This laboratory's radio facilities are remarkable in their capacity and completeness, and probably stand foremost in the world in their application of electronics to the service of national fisheries.

● An interesting aspect of the Japanese industry manufacturing electronics-for-fishing is the extent to which some of these instruments have been exported to countries which themselves have well-developed positions in this field of scientific industry.

Furuno Electric Co., Ltd., for example, has specialized in export trade while supplying the Japanese fisheries broadly. Numerous sounders of the types which it makes specially for fishermen have been exported to Canada, Norway and Spain, which have well-established positions in Electronics in Fishing.

Furuno electronic fishing instruments are reported to have proven particularly effective in the great Lofoten Islands cod fisheries of Norway. This company specializes in sounders with the ability to distinguish individual fish, and by the character of the traces they leave on the record, as well as their schooling habit, depth and other indications, to determine with a fair degree of accuracy. Particularly notable in this field are Furuno instruments developed to serve Japanese high seas salmon fisheries.

King Crabs Are Coy Creatures

● Application of electronic prospecting to the King crab fishery would appear certain to be productive, and it *is* to a certain extent, but results in this field of enterprise have proven illusive, and accomplishment much less distinct than might be anticipated after an examination of the experience with fish.

Japanese crab fishermen, primarily employing the tangle net method, however have found that crab catches are greatest where bottomfish are shown to be abundant on the basis of the echo-sounder's testimony. Whether crabs are confused with fish on the sounder's paper or the cathode ray tube, or perhaps intermingled with them on the sea bottom appears largely academic if productive results are achieved by setting the crab gear where the sounder indicates an abundance of fish.

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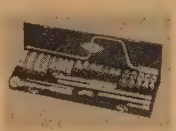

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Radar-Equipped Trollers Find Way to New Earnings

Growth of Battery-Powered, Transistorized Equipment Opens Opportunity for Small Boat Fishermen to Benefit from Electronic Gear

By
KEN CURTIS

● Influence of the space age and electronics progress on the commercial fishing industries is being felt on many fronts. Raytheon Company has been close to the fishing industry for almost half a century. Engineers from Raytheon created the ancestor of the depth sounder which we know today, and coined the trademark "Fathometer" by which depth sounders by Raytheon are known.

With this background dating to the very roots of the electronics industry and with this specialization in those applications of electronics to commercial fishing, the company has been continuously in the forefront of electronic achievements for fishing.

Today, Raytheon radars, Fathometer depth sounders, radio direction finders, and radiotelephones are represented in every facet of the nation's commercial fisheries.

We look to see electronic devices playing an even broader role in finding fish and in helping fishermen to reach port safely and, in time, to market their produce at the most favorable market prices.

An interesting application of radar to this objective is the recent adoption by the salmon trollers, *Sea Ray* and *Lee Ann*. These boats, typical salmon trollers of the northwest, are dramatically changing the technique of salmon fishing. Formerly, these boats could support only one man. Now, radar equipped, they are able to navigate at night, fish late, and remain at sea up to six days, keeping two additional hands busy, the "boat-pullers" are easing the burden of the former solitary boatman, the added earning power of the vessel providing a share for all three.

Even with the added expense of the extra hands, the two boats have increased their take two-fold and dramatically improved their net incomes.

In the King crab fisheries of Alaska, fishermen are using radar to maintain their positions and drag efficiently to find the peak yield. Crab fishermen working the Kodiak and Peninsula areas anchor a radar buoy as a reference spot for their undersea hunt. Then several runs are made to find the best concentration of crabs. Consistent takes of 400 an hour are common using a radar buoy as a navigational reference point for the sea harvest.

In the shrimp fisheries, radar permits the boats to come and go on schedule without losing their turns due to navigation tieups.

Pacific Fishermen find in such compact, low-cost equipment as this Raytheon Pathfinder radar valuable aids to the productivity of trollers and vessels in the King crab fishery, beside other specialized fishing functions.

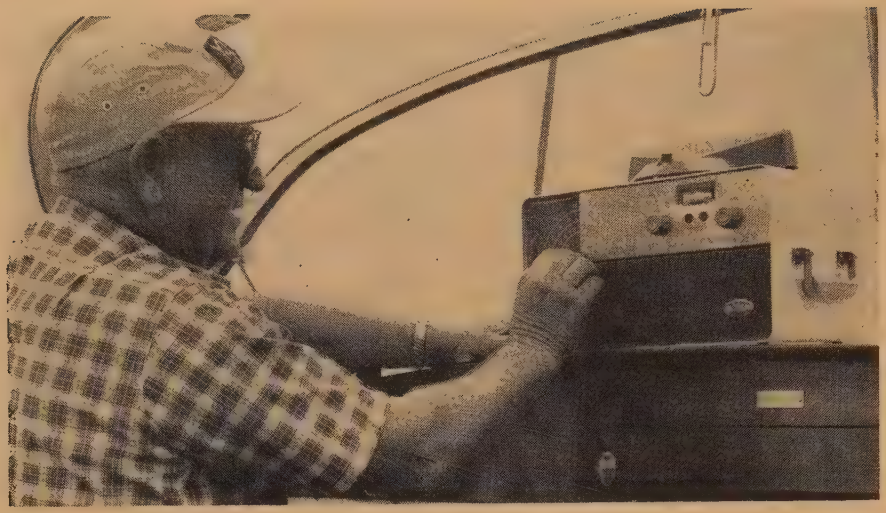
Echo-Sounders are Basic

● Raytheon's experience in providing depth sounders for all facets of the commercial fishing industry has revealed a decided preference on the part of fishermen for recording-type Fathometer depth sounders. These devices which graph the ocean's floor have been selected increasingly by trawl operators. Even small salmon trollers are now swinging to them.

A recording-type Fathometer gives the fishermen a good reference picture of the bottom's profile as the trawl proceeds and, perhaps just as important, keeps it available for a recheck after the trawl comes aboard and results can be evaluated.

Communications are the nerve system of any business—especially in offshore fishing where operating personnel are at great distances from their owners and management ashore. The growth of marine radiotelephones in

NOTE — Mr. Curtis is manager of the Marine Products Department, Raytheon Company, Waltham, Mass.



Transistorized, battery-powered electronic equipment like this Raytheon "Ranger" radio direction finder are extending the safety, convenience and improved fishing made available by electronic equipment to even the smallest, one-man fishing boats with no power on board.

recent years has greatly indicated the emphasis that fishing management places upon dependable communications with their ships at sea.

Into the Future

● Looking to the future, we at Raytheon see many opportunities to serve the fishing industry with new electronic devices that meet the particular needs of certain segments of the industry; e.g., in the area of small trollers, 30 to 50′ in length, the development of a low-cost radar of modest range should assist in their safety and efficiency, just as the Raytheon Model 1500 Mariners Pathfinder Radar has aided the *Sea Ray*. In the field of communications more work is going forward on high-powered, high-frequency equipment that will provide all-weather, dependable communications between the far-ranging fleets working in the Alaskan area and their bases as much as 1500 miles away.

Low power citizen's band radios are also being designed to enable private conversations between boats of the same fleet and permit more efficient control by mother ships. Citizen's band radio, of course, is not a true marine radiotelephone and can be used only to communicate with another person who has the same type radio and the same frequency available. It lacks the opportunity to call for assistance on the regular emergency channels.

Low-Cost, Battery Powered Transistor Equipment Serves Fishermen

● This low-cost equipment, however, will fill a very real need on the part of fishermen who operate in fleets. Radio direction finders with self-contained batteries like Raytheon's Ranger are particularly well adapted to smaller fishing boats having very little power on board. These units become auxiliary channels for receiving marine radio broadcasts and provide recreational radio listening when not being employed as direction finders.

The growth of battery-powered, transistorized equipment for the smaller fisherman is being advanced daily in Raytheon's marine equipment engineering laboratories. Other news from these engineers is a unique shrimp finder. A prototype of this interesting new device will be field tested shortly in the Seattle area.

While striving to create better electronic devices to benefit commercial fishermen, we realize that our fisheries are a vital resource just as surely as forests, fertile land, and mineral deposits.

The protection and cultivation of these resources, so that they may continue to yield rich dividends for future generations who will require the fullest utilization of every available source of food, is a vital trust. We must work together to bring science, understanding and common sense to a balance within our industry.

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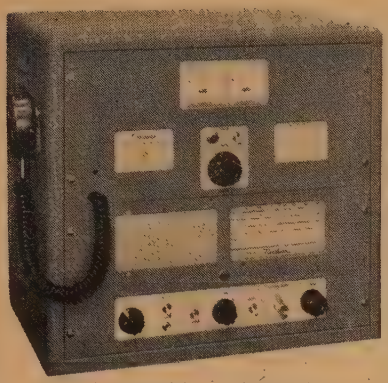

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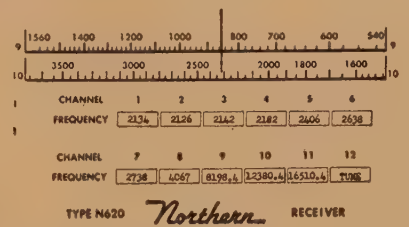

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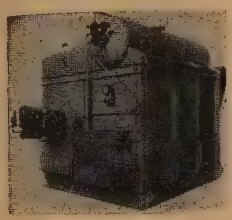

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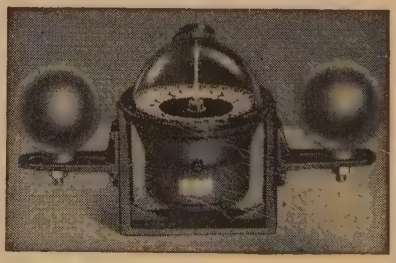

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They Rely on Loran

By
WILLIAM G. MOUNT
Sperry Gyroscope Co.

● Fishermen were among the first to recognize the value of Loran, (LO)ng (RA)nge (N)avigation. It enabled them to stay on the best fishing grounds, regardless of weather or visibility, and more importantly to return to them with unfailing accuracy. Thus:

In 1948 Lowell Wakefield, president of Deep Sea Trawlers, Inc., (now Wakefield's Deep Sea Trawlers, Inc., operator of the trawler *Deep Sea*, acknowledged that Loran doubled their take of King crab. He gave Loran full credit for the first successful American Bering Sea trawling expedition for King crab.

"Only by using Sperry Loran were we able to return to the productive banks after locating them, since hazy weather and distance off-shore eliminated visual fixes," he said, and went on to report that Loran had saved many hours not only in trawling operations but also on the long runs from Seattle to the incompletely charted areas of Bering Sea. He found even dangerous Unimak Pass a "safe highway" with Loran.

This is an example of how Loran is employed by fishermen.

● Now for a spot of history:

According to MIT's Radiation Laboratory Series, "The pulse, hyperbolic, radio grid-laying system for long range navigation, which finally evolved into Loran was first proposed in October, 1940. An order for two receiver-indicators was placed with Sperry in December of the same year, and by 1943 Loran was fully operational in the North Atlantic.

BERNT GJERDE
Master of the Wakefield fishing freezership "Deep Sea."

"In 1942 Sperry demonstrated the first direct-reading Loran. It was a major technological advance in the system and established Sperry in a dominant position in the Loran field. By the end of World War II practically every surface ship of destroyer escort size or better in the U.S. fleet was equipped with Loran."

● Enough history; now some definitions.

ODD. F. RONSTAD
Skipper of the Wakefield crab trawler "Reefer King."

What is a hyperbolic radio system, as MIT describes it, and how is it used for positioning?

Loran is an electronic system for determining a geographic position, primarily at sea. It does this by measuring the difference in time of arrival of accurately synchronized radio pulses from pairs of transmitting stations on shore. Accuracy does not depend upon the ship's compass. It can be used at any time and in any weather, except for severe electrical storms.

Loran is a radio system, but does not determine bearing lines, like the radio direction finder. Where RDF takes its position from the *direction* of signals, Loran operates upon the *time lapse* in signals.

The Loran stations, which cover the world, send out short bursts of radio energy, spaced at regular intervals. The stations operate in pairs, a Master and a Slave usually about 200 to 400 miles apart, sending out these pulses at the same recurrence rate. The Loran receiver enables the navigator to measure the time which elapses from the instant the master pulse is received until the slave pulse is received—to a millionth of a second. This is a measure, then, of the difference in the two distances from the ship to each of the two stations ashore. By switching to a second pair of stations and obtaining a second fix, the ship's position can be established by the intersection of the two lines.

ARNE SERWOLD
Master of the King crab dragger "Shelikof."

● A fisherman such as Capt. Allan J. Foote, who says, "If you threw a baseball over the side in Boston Harbor and allowed for the tide, I could pick it up by navigating with Loran," does it this way:

He tunes in the first stations, matches signals on a cathode ray tube, received from the master and the slave stations, thus giving him the time lapse which is read out on a chart. This is the first of two bearing lines. He next tunes in a second pair of stations, repeats the same process, giving him the second line. He goes to the charts, where these lines intersect, that's where the baseball will be.

On one trip to Cultivator Shoal, off Georges Bank, 200 miles out of Boston, Capt. Foote and his crew traveled four days and fished five more without once seeing the sun. Sperry Loran kept the 125-foot trawler on a spot 25 fathoms deep, a third of a mile wide. "It was thick fog,

'Until recently Loran has been a costly instrument for the small fisherman. Earlier this year, however, Sperry marketed the first low cost Loran, bringing it well within the range of small boat operators. The new Loran, despite its low cost, is every bit as accurate as the larger, more expensive Loran.

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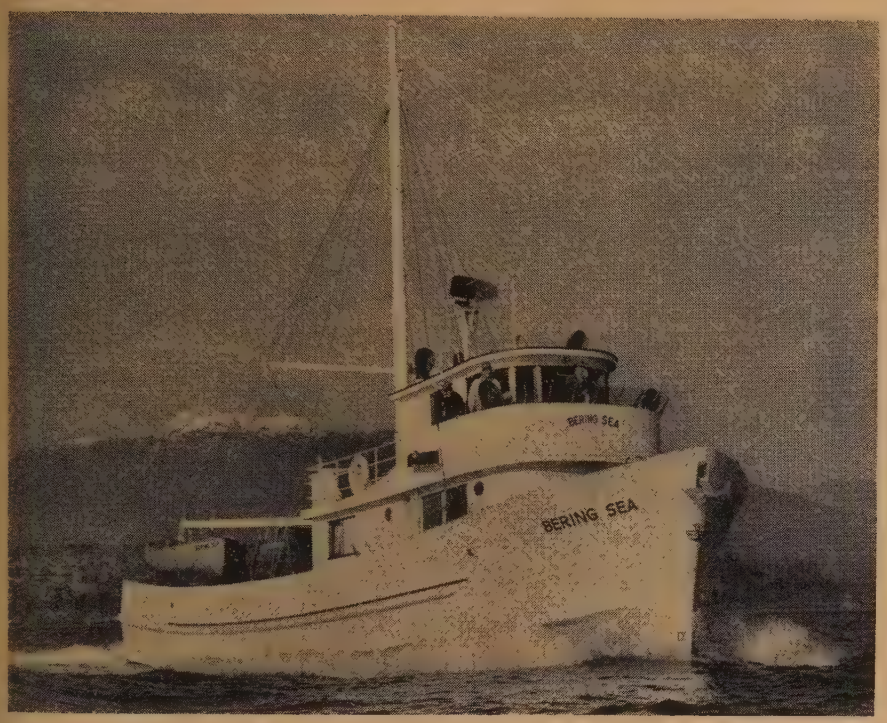

Bering Sea is typical of the powerful, electronically-equipped Canadian fishing craft which are giving British Columbia some of the best production in its rich history. Pioneers of echo-fishing, these vessels now are reaching out as well as down, with installations of asdic and radar.

● British Columbia's fishing industry, whose production last year had a marketed value of close to $100,000,000, would be virtually helpless today without electronics.

Perhaps nowhere has there been a more general and effective application of electronic instrumentation in commercial fisheries than along Canada's west coast, from the Gulf of Georgia to the Alaska line. Fishing without echo sounders, radio-telephones and to a lesser extent such scientific gimmicks as radar, loran, cathode ray and asdic sounders, would seem primitive indeed to today's fishermen, and certainly much less rewarding.

Yet the introduction of electronics happened only yesterday, in a relative sense. Fishermen operating out of Vancouver and the Fraser River, Victoria and other island ports, Alert Bay, Rivers Inlet, Prince Rupert and all along the B. C. coast, who have become so dependent on electronics, find it hard sometimes to realize that none of these amazing gadgets was available for practical use by fishermen before World War II.

The echo sounder was the first to be applied, and by today's standards the pioneers were instruments of severe limitations. One of the first men in the industry to recognize the sounder's possibilities in locating herring and other fish was Dr. C. R. Elsey, vice president, research and development, British Columbia Packers, Ltd.

Canada's Electronic Pioneers

● That was in 1939, and while some time elapsed before Dr. Elsey could get practical fishermen seriously interested, he made numerous inquiries in Europe and elsewhere; and in 1944 his company purchased a sounder operating on the familiar dry-paper-in-tank principle. The device was installed on the scout boat *Nishga*, and the results were so encouraging that in the spring of 1945 Einer Jensen, fishing for B. C. Packers, became the first individual fisherman to make an installation. He was followed closely by Captain Charlie Clarke, long-time high-line fisherman for Nelson Bros. Fisheries, whose vessel at that time was *Western Girl*. A month later, Norman Fiddler put a Hughes Owen echo sounder on his *Dollina* (it's still operating, incidentally)—and the new era had arrived.

About that time, Ekolite, Ltd., became the first manufacturer of echo sounders and depth recorders in the Vancouver area, entering competition with companies that had been in the field for some time. Fishermen generally became interested and competition between various companies, together with technical improvements, brought the price within reach of most of the more successful vessel owners. Captain Clarke recalls that his first echo sounder cost in the range of $5,000. Within a couple of years similar units could be bought for half that price.

Dr. Albert A. Tester, then with the Fisheries Research Board of Canada based at the Departure Bay biological station, now a scientist of the University of Hawaii, was one of the first to make a thorough technical investigation of the echo sounder in its application to the B. C. fishing industry. His research was based on the experience of the *Nishga* with its Husan Model MS III during its herring exploration in Satellite Channel off the Saanich peninsula, Vancouver Island.

Many satisfactory recordings were obtained, with the characteristic dark patches indicating schools of herring.

Results were checked by means of the then standard "feeling wire"—a reel of piano wire with a 5-lb. lead weight on the end which was lowered to various depths and the wire felt for vibrations as the fish bumped against it.

"A good man on a wire, with fingers as sensitive as a safecracker's, could tell many things about an unseen school of fish, but the *Nishga* demonstrated that the sounder had many advantages over the old system," says B. T. Richards, an authority on electronics in fisheries.

Captain Clarke, who has been fishing off the B. C. coast since 1915, and who returned to fishing again after serving during World War I in the Navy, recalls that the feeling wire was commonly used during his early years. Before its introduction the only detection was through the fisherman's sense of hearing.

"A fisherman with a good pair of ears could hear the 'flipping' of the herring as they broke surface at night," Captain Clarke told *Pacific Fisherman*. "Or, if he couldn't hear so well he could use his eyes and watch for the 'play' of fish as they jumped; and of course the presence of sea lions and birds was also a good sign. Nowadays, you can't help wondering how we managed to make some pretty fair hauls during that period. Today, there's hardly a fishing vessel of any size — troller, gillnetter or seiner — without an echo sounder. The echo sounder and several other pieces of electronic equipment are a 'must' for the successful fisherman today."

Captain Clarke who has made some of the biggest individual herring catches ever recorded on this coast, and who is a keen student of commercial fishing technique, has made a study of electronics and the history of that science. He says that as long ago as 1890 a crude "flasher" type of echo sounder was in use in Europe, and in 1910 a German invented a flasher-type sounder that found considerable popularity in naval circles. The British Navy in particular made important advances during World War I, using graphs to record depth. However, then, and during the years that followed, echo sounding was pretty much of a Navy monopoly. Certainly, it didn't come into use among fishermen until much later.

Sciences's First Diagnostic Report

● Summarizing his findings with reference to the *Nishga* experiment, Dr. Tester reported:

"The sounder will record the presence of fish at depths to 65 fathoms (as proven) and probably to 90 fathoms or more. The wire, on the other hand, can be used satisfactorily only at depths to about 50 fathoms. Below that, the impulses caused by the wire striking the fish are muted and indiscernible from vibrations caused by the wash of the boat.

"The sounder shows the exact depth, and both the upper and lower limits, or 'thickness' of the school . . . the wire gives the depth of only the upper portion of the school.

"The sounder gives a continuous record of the bottom as well as the school of fish, thus reducing the chances of snagging."

"The sounder will locate herring when they are so thinly scattered they cannot be felt by the wire . . . the information that scattered fish are present is useful knowledge when scouting.

"With the sounder, herring can be located when the ship is traveling at full speed; whereas with the wire it must travel very slowly.

"Fish can be located with the finder regardless of weather conditions, which sometimes limit the use of the scout boat and wire."

● Even with this modest indication of what the echo sounder could accomplish, there were many skeptics in the industry who regarded the *Nishga's* experiments and Dr. Tester's report with scarcely concealed amusement and disbelief. Certainly they would not have even guessed that the time would come, as it has today, when the average fisherman could explore the depths to a distance of 500 fathoms quite readily. Whaling vessels, operating off Vancouver Island for B. C. Packers, have equipment that will reach 1200 fathoms.

"There's really no limit today," an official of Ekolite, Ltd., told this journal. "Fishermen seldom have need to go below 500 fathoms, but it's simply a question of power. If the power is added in sufficient volume, the sounder will reach bottom just about anywhere."

Sea Nymph, one of the versatile British Columbia gillnetters, is typical of the smaller craft in Canada which are equipping with Spilsbury & Tindall radar. Note the scanner of her radar on the house.

High-Liner Gives Sounder Credit

● Captain Johnnie Dale, another celebrated high-liner for many years, was another pioneer in the use of the echo sounder, which at first had been conceived as a navigational aid rather than as a detector of fish. He was the first of the Canadian Fishing Co. skippers to install an echo sounder, and he has no hesitation in giving that instrument full credit for some of his big catches.

Historians of the industry regard the experience of H.M.S. *Challenger* off the southwest coast of England in 1933 as significant. While using a deepsea echo sounder in 40 fathoms and on an even bottom, the officers and crew were surprised by observing rapid shoaling to five fathoms. Engines were promptly reversed and 40 fathoms was again recorded. A buoy was dropped to enable further investigation and once again the five-fathom depth was indicated. The conclusion was that the sounder had detected a dense body of fish which had been temporarily dispersed by the noise or vibration of the engines when they were put astern.

In that same year, 1933, the first continuous record of the sea bottom was made, using a new type of sounder, with paper recorder; and thereafter it was possible to determine the relationship between observed schools of fish and actual catches. Today, echo sounders are being used not only to detect fish and sea depth but also areas where feed is abundant.

Recent Radar Growth Notable

● During the past two years there has been a notable trend towards the use of radar in the B. C. fishing fleet. In this field again Captain Clarke was one of the first entries, with installation of radar antenna on his *Veta C*, now the *Western Producer*. But radar is still a comparatively costly piece of equipment and consequently is in more limited use. The earlier objection to radar as being bulky and cumbersome is being overcome by some man-

ufacturers such as Decca, whose D7 model is winning support because of its compact yet rugged construction. The lightweight Lavoie Bat radar is also popular in B. C.

The halibut fleet finds radar particularly useful, and probably 40 or more Canadian vessels are so equipped. In foggy weather, radar is effective in locating buoys. Similarly, in the halibut fleet direction finders are becoming popular and especially in the Bering Sea Canadian fishing vessels have been using loran to obtain their true bearing in open waters. By the use of electronic waves, vessels can be spotted on productive fishing grounds with far more precision than other methods make possible. Disabled craft can be located with greater ease, and loran is often used to lead vessels back to areas where they previously made good hauls, being inestimably more effective than dead reckoning. But, as with radar, loran isn't a gadget that can be picked up for a few dollars, and in Canada it is felt some time may elapse before it can be regarded as standard equipment.

● Radio-telephones are widely used by fishing vessel operators in B. C., and while there is no specific breakdown between those being used by towboats and by fishing vessels, the total installations are more than 3,200, and it is estimated that more than 2,000 are in service for the fishing industry in one way or another.

"Apart from being an essential factor in our everyday operations," said a packing company executive, "radio-telephones are the best life-saver we have.

● Several B. C. fishermen have recently installed asdic ranging instruments, Canadian Marconi being the distributor for the Simrad, manufactured in Norway by Simonson Radio A/S of Oslo. The Simrad master sounder is being supplied with the Basdic—a transducer mounted on a rotating vertical staff working as well in the vertical as on the horizontal plane. The control stick indicates the direction from which the echoes are received while the distance is shown on the echo-gram paper. It is claimed that even a dinghy might be equipped with a combined echo sounder and asdic.

One of Nelson Bros. Fisheries skippers is installing an asdic sounder, first of its type in B. C., on a power skiff, where it is expected to be particularly effective.

More Electronics Material Next Month—

Abundance of valuable and interesting editorial material bearing on *Electronics in Fishing* exceeded capacity of the editorial pages of this issue. In consequence it has been necessary to postpone publication of a number of articles to future numbers of Pacific Fisherman.

Here's the one for rigs that need *real* power . . . Evinrude's great "Four-Fifty." New, compact V-4 design. 70.7 cu. in. displacement. Delivers 50 solid b.h.p. at 4500 revolutions—easily, smoothly, quietly—in toughest day-in, day-out service. See your Evinrude dealer—he's listed in the yellow pages under "Outboard Motors." Complete range of models to choose from. Evinrude Motors, 4154 N. 27th Street, Milwaukee 16, Wis. *A Division of Outboard Marine Corporation. In Canada: Mfd. by Evinrude Motors, Peterborough.*

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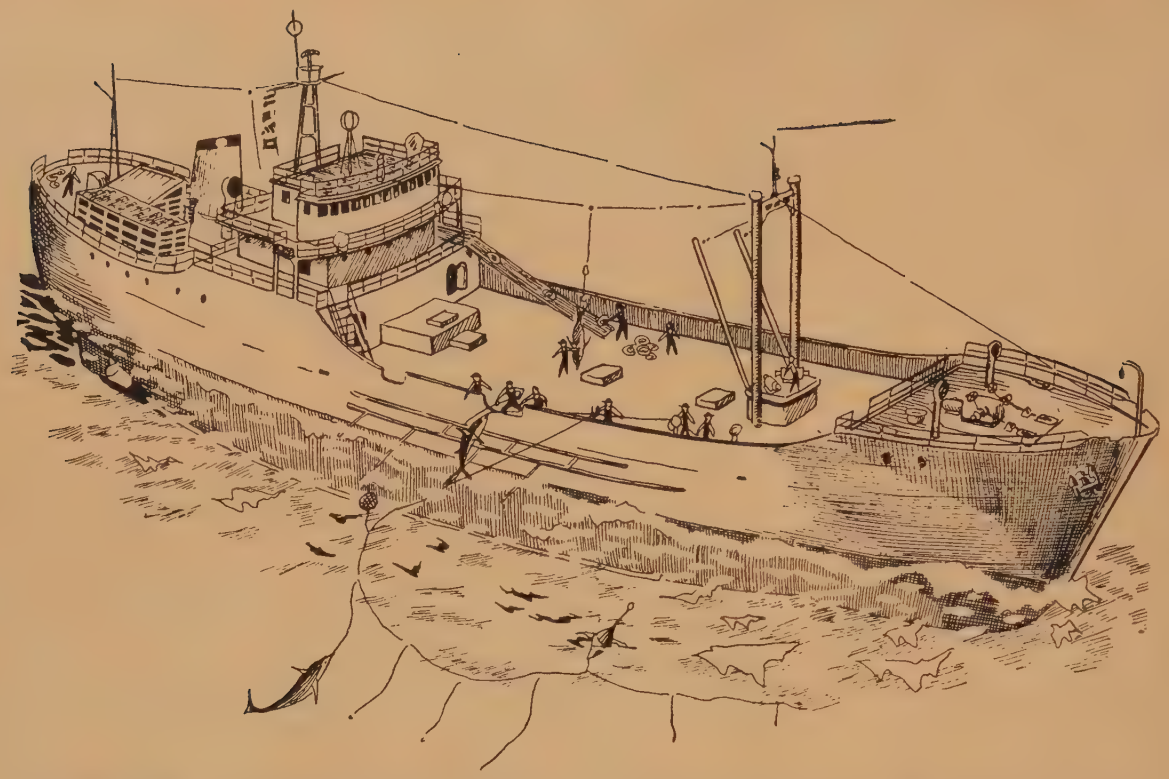


Tuna Longliners up to 1,000 gross tons catch tuna for Japan throughout the world's warm seas. They have the finest of radio communication and navigation equipment, use supersensitive sounders to set their lines at the most productive depths in the DSL, and navigate by radar and loran.

Indispensable Echo-Sounder Radio-Phone Electro-Pilot In Tuna Fishing

● Tuna fishing in the Southeast Pacific ocean is a high-seas operation carried out by vessels of considerable size, operating scores, often hundreds of miles out to sea, also remaining at sea for weeks or months at a time.

Under these conditions, electronic *navigational* and *communication* equipment is indispensable for efficient and economical operation of a vessel in a competitive fishery.

Also necessary to any skipper who wants to catch as many fish as possible in the shortest possible time are electronic *fish-finding* aids—depth indicators which guide him to the submarine mountains where fish are usually to be found, and actually reveal to him the presence of a school of fish.

Fish finding instruments are also used, very importantly, for finding bait fish as well as pay-load fish. This function, of course, calls for a specialized type and range of depth-finder, and it is in this field that the newest development in electronic sounders has taken place.

Portable Depth-Finder

● This newest development as a tuna tool is a portable, small-size transistor-type depth finder designed for use by fishermen in a bait-skiff looking for bait. The unit, which is just being released to dealers as this is written, measures about 7" in diameter, 7" deep, and weighs about four or five pounds. It is made by Raytheon Manufacturing Co.

The new Raytheon portable can be carried in the hand of a fisherman, or can be readily installed on the bait-skiff.

One special feature about the new unit is that the dial can be read easily in broad, bright tropic sunlight — which is quite a problem even with fixed long-range depth indicators. Easy reading is achieved by a special way of angling the dial glass so that the brightness of the sun's light is deflected. This makes it possible to read the dial clearly in the sunlight without providing a light so bright as to be blinding when the dial is read at night.

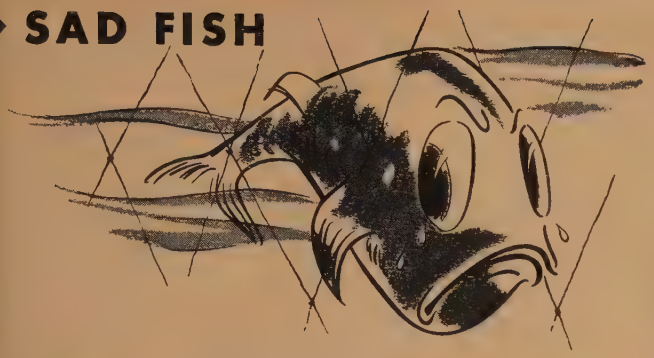
Echo Sounder is Universal Aid

● It is safe to say that virtually every tuna fishing vessel of any size at all is equipped with some sort of an electronic depth finder. Obviously, the bigger the boat, and the farther out she cruises, the heavier and longer-range her depth indicator will be.

The longest-range depth finders used have a range of 1,000 fathoms, which can be extended to 1,500 fathoms by basing the dial reading on a second audible ping heard the second time the indicator needle sweeps the dial.

Generally, depth indicators are used by tuna vessels in three ways:

SAD FISH



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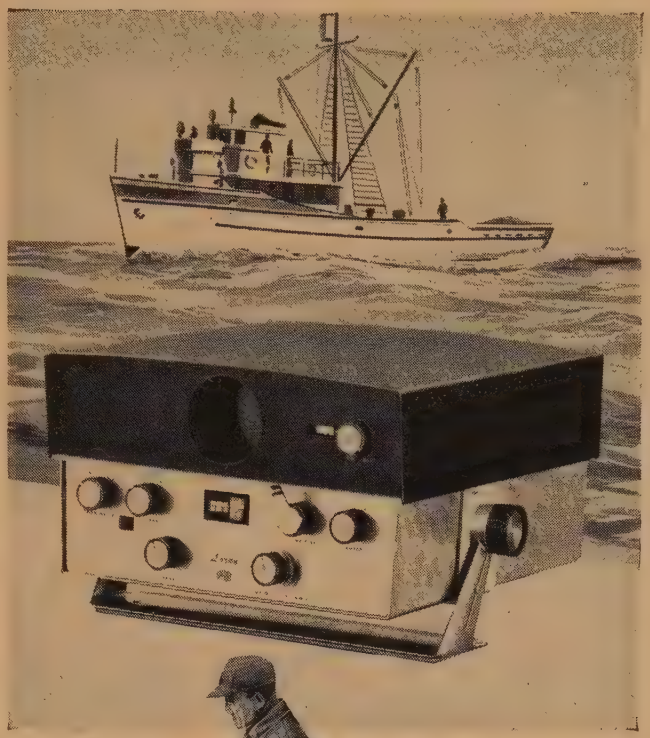

Time difference indications are easily determined for application to Loran charts.

New! Loran "3"

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(1) *In navigation,* as an additional method of checking the vessel's position, besides celestial and chart observations. The depth indicator shows the bottom depth, which the skipper can check with his charts to confirm his position.

(2) *To locate* banks where fish are usually to be found.

(3) *To locate fish,* which show up on the depth indicator just as the bottom itself does. In the case of tuna clippers, which use bait which has to be caught at sea, a depth indicator of shorter range is almost always carried aboard the bait skiff which is used to catch bait in a net, and which ventures into shallower waters, and catches fish at shallower depths than does the clipper herself.

An additional, and sometimes important use of the electronic depth recorder is in keeping the boat over a bank overnight or over a period when fishing operations have to be suspended for some reason or other. Knowing the depth of the bottom where he has been fishing, the skipper can keep his vessel over the same spot in spite of currents and winds, and be ready to resume fishing at any time in the same place.

● The market for the deepest-range electronic depth finders is virtually limited to the tuna bait fishery, where vessels are bigger and go out farther. In fact, the market is so limited that very few 1000-fathom depth indicators are being installed now. Clippers and seiners now being built on the Pacific Coast are being equipped with 600-fathom indicators.

Self-Steering Ships

● In virtually universal use on tuna vessels is the Sperry Magnetic Compass Pilot, an electronic device that holds the rudder on a pre-determined course. Every tuna ship of any size at all has an automatic pilot, and the old traditional picture of the skipper standing at the helm holding the ship on her course is no longer seen in actuality. He is more often found leaning on the rail looking for signs of fish.

It goes without saying, however, that even an automatically-controlled course has to be checked regularly to compensate for deviations caused by drifts, winds, etc.

Most automatic pilots have an extension control which enables the skipper to maneuver the ship from a position outside the pilot-house—the position he most frequently takes up when fishing operations are actually in progress. With an extension cord he can control the boat while standing at the rail where he can see what is going on on the after-deck and all around the vessel.

● Most vessels in the Southern California fishery are equipped with radio direction finders, which are purely navigational aids to help a vessel establish her position by intercepting radio signals and computing.

An electronic fishing aid carried by virtually all fishing vessels, large or small, American or foreign, is the two-way radio phone. Aboard most tuna vessels, the radio is always turned on, and messages are constantly flowing back and forth between vessels and between home bases and vessels at sea.

The two-way radio is a fish-finding aid, as skippers report to each other on the run of the fish at various locations. It is also, of course, a vital safety aid in case of rough weather, or when vessels get into difficulties of any kind. Many a fisherman, victim of accident or sickness at sea, owes his life to the two-way radio and timely aid by another vessel.

Electronics in South America

● In the fisheries of Ecuador and Peru, where electronic aids are only just coming into wide use, the two-way radio is the most widely-used of this class of equipment.

For example, the entire fleet fishing for Inepaca, the Van Camp Sea Food Co. cannery at Manta, Ecuador, is equipped with a two-way radio, with a master station at the "Van Camp House" in Manta and another at the cannery itself. The shore station communicates not only with the vessels at sea but with the U.S., and through the Bell System-ham radio hookup, Americans working at the Manta plant can talk not only to their offices in Long Beach, Calif., but occasionally to their families at home.

According to Van Camp spokesmen, the Manta radio aids fish production in several ways: It is a fish-finder, skippers reporting to each other and to the cannery on the run of fish in one direction or another from home port. It keeps the cannery informed on the quantity of fish being caught, so the plant can be ready ahead of time for the tonnage that will be coming in. Although most of the boats supplying the cannery are day-boats, all are equipped with radiophones, which are paying their way in greater efficiency and economy.

In the anchovy fishery out of Callao, which supplies the booming Peruvian fish-meal industry, electronic aids are said to be coming into wider use. Skippers are more inclined to acquire these improvements now that they have made good profits in the anchovy fishery for several years running.

Two-way radios are the most widely used electronic aids in the Peruvian fishery. Up to now there have been few depth indicators put in service, and some but not many direction finders. The future of electronic aids in that fishery is as promising as the future of the fishery itself. As the industry develops, economy and efficiency in fishing will become more and more important, and electronic aids are essentially means of increasing efficiency and economy.

Electronic Things to Come

● In the fisheries of Southern California and Latin America, this is a period of great, basic changes. New inventions like the power block and the nylon net are bringing about a new balance in fishing methods; electronic equipment of various kinds is as great a cause as any in the changes that are taking place.

What now about the future?

Electronics, according to forward-looking men in the fishing business, will cause still greater changes in fishing methods in years to come. Electronic fishing will take its place as a standard method of harvesting fish, and will bring in as much tonnage from the sea as seining or clipper fishing do today.

By electronic fishing is meant the use of electronic methods and devices to attract the fish, and electronic equipment for actually bringing them into the vessel—and this again means revolutionary new designs of vessels for electronic fishing.

Not many weeks ago the Sunday supplements of many newspapers carried a comic-strip prophecy of the fishing vessel of the future, showing great quantities of fish being attracted to a fishing vessel electronically, and being drawn up into the hold of the vessel by electronic means, taking advantage of the fact that fish are somehow attracted by a positive electrical current.

This looked fantastic, and the reader's first thought was that this picture of future fishing was published right where it belonged — in the funny-paper. But a second glance showed that one of the co-authors of the item was Athelstan Spilhaus, member of the joint Committee on Oceanography formed in 1957 by the National Academy of Sciences and the National Research Council. Mr. Spilhaus is also on the faculty of the Institute of Technology of the University of Minnesota; so he is no wild-eyed science-fiction writer. He is a man whose views on future fishing, whether they appear in a funny-paper or not, are serious and well worth thinking about.

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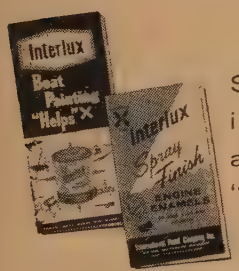

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Automatic Direction Finder

Proves Invaluable in Fishing

● Outstandingly notable among recent successes in the application of electronics to fishing on the Pacific Coast of the United States in particular has been the ADF or automatic direction finder.

Bendix-Marine ADFs have been installed on a large number of Pacific fishing vessels, where they have been particularly effective in putting the boats on fish reported by spotter aircraft or fishing fleetmates, and this without the necessity of the fishing vessel's master computing position on the basis of bearings as in the past.

Some Pacific fishermen characterize the ADF as a greater contribution to advanced and profitable fishing than was the radio direction finder over the original radio compass with its necessity for asking two shore stations to report bearings on the vessel's signal, and to plot the boat's position from these data.

First full fishing season with the Bendix ADF was that which closed in Southern California early in 1959. It was a good one, and a number of skippers are not at all hesitant to ascribe a substantial part of that success to their automatic direction finders.

For example, Capt. Frank Gargas, skipper of the ADF-equipped *Columbia,* fishing out of San Pedro, says: "We wouldn't leave port without the ADF working. We use it continuously to locate our spotter aircraft and proceed to the 'hot spot'. Once we've found it, we direct the rest of the fleet to the area".

Final Adjustment of the Bendix ADF on the new tuna clipper **Larry Roe.** The bearing is shown on the scope and dial accurately and instantly.

He points out that *Columbia's* ADF is used less for navigation than it is for "homing" on "hot" areas reported by the spotter plane or other boats. However, in coastwise travel or runs to the fishing grounds *Columbia* uses her ADF regularly for radio bearings on both beacon and broadcast stations. "We seldom bring out the sextant anymore," says Capt. Gargas. "We can get our fixes much faster with the ADF, and also the times are numerous when limited visibility along the coast prevents celestial navigation for those who like to keep in practice.

● *Columbia's* skipper says the cost of the Bendix-Marine ADF was earned on the first trip with it, for visibility was poor and it was only because of *Columbia's* ability to get fast, accurate bearings on the spotter plane that she was able to find the fish. She had her 140-ton capacity filled in far less than the usual time.

Success of the equipment on *Columbia* and other early users led to its installation on a number of other craft, including the *City of Los Angeles,* owned by Capt. John Gargas, a cousin of Frank; the *Sea Pride;* and the 136′ giant seiner *Santa Helena,* converted to net fishing from tuna clipper service.

ADF is attractive to tuna clippers as well as purse seiners, and the new vessels built by National Marine Terminals, Inc., of San Diego, representing some of the most modern and capable American fishing vessels, all are being provided with this equipment.

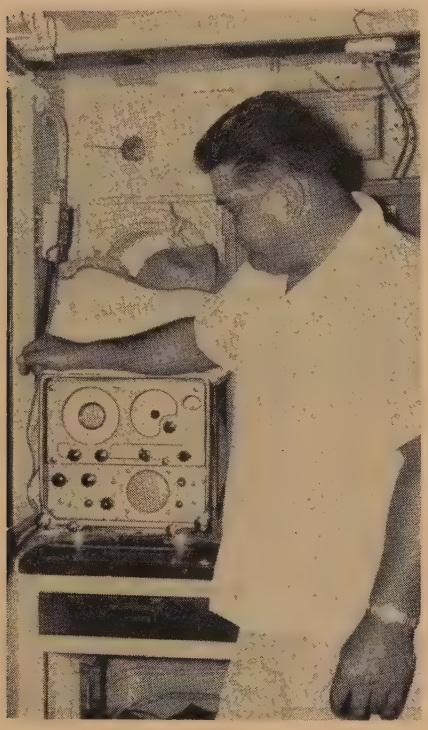
First of five such vessels to carry the ADF is the 380-ton *Larry Roe.* In addition to this group of brand new vessels, National Marine Terminals has indicated that it plans eventually to equip all its tuna fleet—numbering some 12 older craft, with this modern electronic aid to fishing and navigation. *Sea-Preme* was the first of the NMT fleet to mount an ADF.

● On these clippers the automatic direction finder has proven that the accuracy and speed of getting bearings cannot be equalled by manually operated direction finders. These require a rotatable shaft between the instrument and the loop, which limits

Sea Pride, tuna and sardine seiner, is one of the California fleet of vessels recently equipped with automatic direction finders, which are proving invaluable aids in their fishing.

the area of practicable installation; where with the ADF the loop is fixed, permitting it to be mounted atop the mast, and connected with the instrument in the pilothouse only by a multi-conductor cable.

Big advantage of the Bendix automatic direction finder is its instantaneous presentation of the bearings on the oscilloscope tube without necessity



Frank Gargas, master of the sardine seiner **Columbia,** with his Bendix-Marine automatic direction finder.

for manually swinging the loop. To this must be added the ability of the unit to get an accurate bearing on a transmitter too weak to give an audible null with conventional direction finders. With the Bendix ADF, determination of sense is handled merely by pressing a button, which shows graphically whether the transmitting station is ahead, astern, to left, or right. Determination of bearing and sense is accomplished in two seconds.

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For both efficiency and economy the full range of these Recorders is achieved by using "Step Scales" of 20 fathoms (or 60 feet) each. This, in effect, provides a magnified view of each section, giving far greater definition and detail than any low cost recorder on the market.

The wide viewing window permits mounting the Recorder in any convenient location. The window hinges open for making notes on the chart paper. See these outstanding new Depth Recorders at your Bendix dealer today. Only $299.00.

SPECIFICATIONS

Range	DR-18: 0-20, 20-40, 40-60 fathoms with 2½ fathoms overlap between scales DR-19: 0-60, 60-120, 120-180, 180-240, 240-300 feet with 7 feet overlap between scales
Soundings per Minute	DR-18: 200 DR-19: 400
Frequency	75 KC
Chart Size	Overall Width: 2-14", Scale Width: 1.8", Length: 75 feet
Chart Speed	⅓" per minute (45 hours total operation per roll)
Voltage	12 DC, 32 DC
Current	3.3, 1.2 amps
Weight	Approximately 12 lbs.
Dimensions	10-9/16 wide, 7-1/16 high, 7 deep.
Transducer	Choice of integral or separate tube type.

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Radiophone Problems

A Serious Look at their Causes, What the Solution Will be, and How and When it will be Achieved

• Marine radio merits attention in this issue even though it is hardly a new electronic aid to fishing. This is particularly true because there are new problems attendent upon the full employment of this oldest electronic tool of the fisherman, and new methods and equipment to solve these problems.

Are they problems or full-grown emergencies? Has electronic communication become something less than a key to the progress of the fishing industry? It is plain that the fisherman will have to consider several changes in equipment in order to get maximum use of the radio as a reliable safety signal, a means of working with other vessels, a monitor of the distress signals and other communications of other boats, a dependable reporter of weather conditions and a link to shore telephone communications. Today's developments suggest several approaches to full benefit from the fisherman's radiophone. Among them:

1. *New crystals* — There are now several marine telephone stations operating on different frequencies. Some fishermen find they don't have enough crystals to make best use of the ones they need. The man with a five-channel set operating on Puget Sound, for instance, uses one channel for the distress-and-calling frequency (2182 kc) and two channels for ship-to-ship communication (2638 and 2738) and one for Pacific Telephone's station KOW transmitter at Edmonds, Wash. (2126). Then he is faced with the choice whether to use his one remaining transmission channel for the North-west Telephone Co. facility in Vancouver, B. C., or for the newly uprated *alternate KOW channel.* These are 2142 and 2430 kc. respectively, and if he has a 5-channel set he can't use both. The Vancouver channel has the advantage of full-time day-and-night service. The KOW-2 channel is daytime only, but has the advantage of lower cost and less backlog of calls, less waiting, plus the fact that it is a simultaneous alternate to KOW-1. This demonstrates the advantage of a six-channel set or larger; and the situation is the same for fishing vessels operating down the Pacific Coast, where there are other telephone frequency choices, or to the north in Alaska, where there are alternate frequencies for ship-to-ship calling as well. Larger radiotelephone units are becoming more popular for this reason—they contribute to the versatility of the fishing vessel.

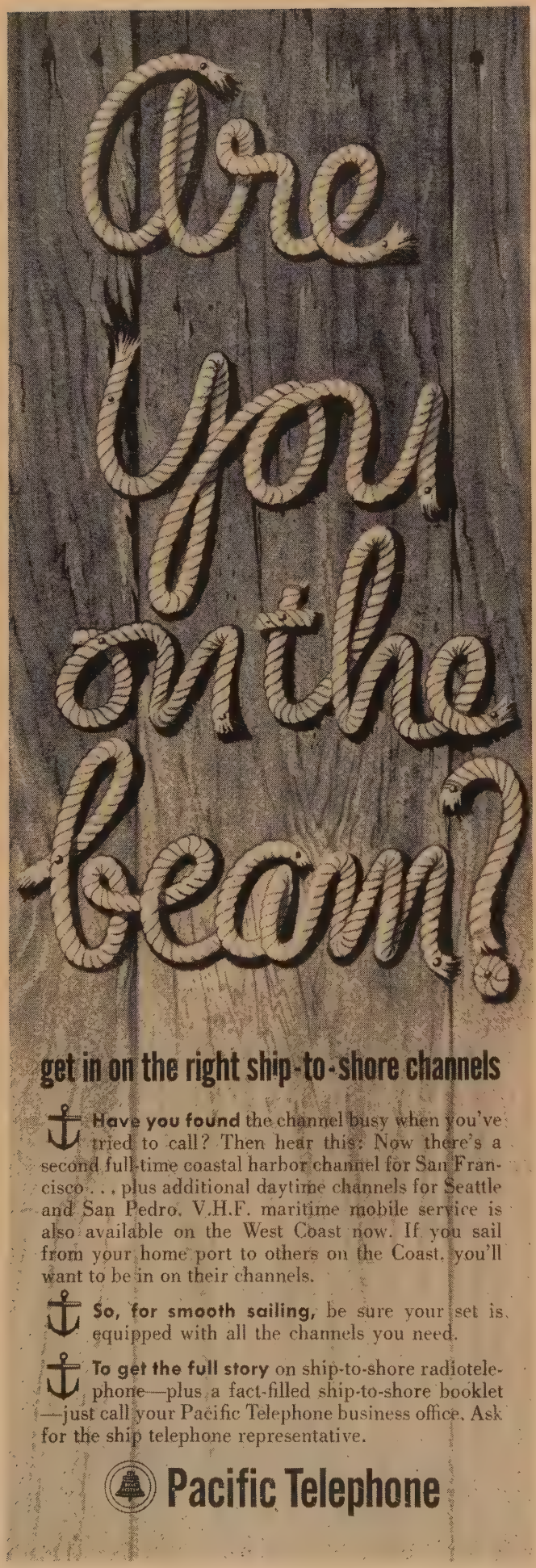
2. *VHF radio*—In many cases fishermen can put to good use an extra set for very-high-frequency transmission at line-of-sight range. It offers better reception and more free and private use. It is no substitute for regular ship radio because it is not Coast Guard-monitored, thus is of little use as a safety-device, and the average fisherman often is out of range. It is useful among fleets operating at close range, and of course many fleets of harbor tugs find it ideal for dispatching purposes, linked to the fleet's own shore station. In commercial fishing on the North Pacific its use will no doubt continue to be limited, due to the range of operation and the mountainous terrain of much of the coast.

3. *Deep-sea radio* — Increasing in popularity among fishing vessels working far at sea is the larger transmitter of 11 or more channels which can signal "over the top" at several frequencies to 18,000 kc. This offers several alternate channels for communication with KMI in the San Francisco area from any point on the ocean, thence to any shore telephone; and for working ship-to-ship at greater distances with better reception, less interference. This is believed to be the marine radio of the future for more fishing vessels, particularly those in long-range service such as tuna clippers.

4. *Monitoring devices* — With the strengthening of FCC enforcement of the rule that vessels monitor 2182 whenever the set is on, plus the desire of most fishermen to know what is happening on one of the working frequencies for ship-to-ship, the fisherman has the choice of: (1) a "channelguard" attachment to his radio so it will play these two frequencies at once; (2) a loudspeaker attachment to bring the sound to working areas aboard ship; and (3) a portable radio direction finder. The latter is most helpful because it serves all three functions in one piece of equipment. It brings in the extra channel, can be moved to working areas, and can be used of course to find the direction of an interesting conversation about good fishing! It has the added advantage that the fisherman can take it home when he gets ashore, as an extra radio. The small, transistorized portable RDF is likely to be found among more and more fishing vessels in future. With self-contained batteries it doesn't drain the electrical power of a small boat.

5. *"Type-accepted" sets*—Most fishermen are aware of the much-publicized FCC rulings that all new sets be type-accepted. As of January 1, 1963, some 90% of radiotelephones in the North Pacific fishing fleets will have to be replaced to conform with FCC rulings. Already the type-acceptance requirement is in effect for new vessels or any vessels where a radio set must be installed. All existing sets are sufficient at present, as long as they stay on the same vessel. (They are not supposed to operate on 2738 kc. even now, however, if they are not type-accepted.) The date of effect of this rule originally was much earlier. Delay of the ruling benefits fishermen, but actually was requested by manufacturers, hard-pressed to standardize at once on FCC type-acceptance in new models.

6. *Procedure changes* — The FCC "crackdown" on improper use of marine radio is likely to gain momentum. Little detailing of FCC rules is needed here except to emphasize three main points: (1) the 2182 channel is to be



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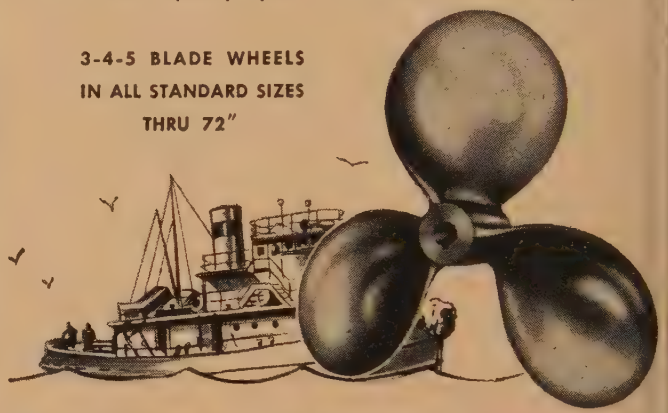

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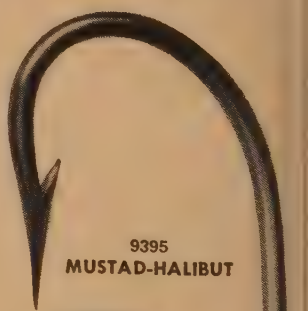

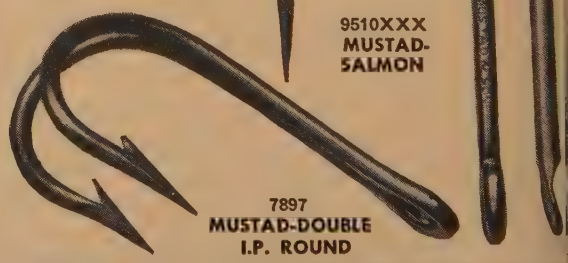

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used only for ship-to-ship calling and to be followed immediately by a shift to another frequency for conversation; (2) no calls are to originate on other frequencies; (3) no use of radio is to be made at all except for matters pertaining to ship's business; and then of course there are the rulings about logging calls, the matter of four-letter words, etc., all of which need no discussion here.

New radio frequencies—

● What has happened to the fisherman's oldest electronic tool? To many people it seems that the ether is now so clogged with signals that radiotelephony service to fishing is seriously impaired. The electronic jungle is of greatest concern to the fisherman on Puget Sound and adjacent waters. His crackling receiver amplifies the character of this emergency of a hot summer night, with seiners and gillnetters hailing buyer boats, tugs reporting their tows, and argosies of yachtsmen calling for a rendezvous. The human ear is an amazingly adjustable device, greater than all the electronic wonders, but it has its own limits; so does the wonderful patience of the fisherman.

The situation is comparatively ideal in British Columbia, where the several types of vessels each have their own working frequencies; and in Alaska, where individual fleets have a variety of working channels on the air. In southern waters the problem is alleviated by the greater use of VHF and high-seas frequencies. North Pacific fishermen and others have organized in the past two years an agency to express their pleas, to the FCC as well as the radio manufacturers. It is known as the North Pacific Marine Radio Council, currently headed by James Dolan of Seattle. It has repeatedly petitioned the FCC for new intership working frequencies in addition to 2638 and 2738. In answer to the FCC's advice to use VHF transmission, so successful in other areas, it points out the uselessness of this straight-line contact in island-dotted coastal waters and the open sea.

If you're working with a VHF transmitter among the San Juan islands or other mountainous areas, you might as well be cruising on the moon. Your signal goes straight over a mountain and through the sky. If you put out a distress call on VHF, you might as well be on Mars or Jupiter, for there is no constant monitoring of VHF channels. The Council points out that it must share its two working channels with Canadian vessels, which have their own separate working channels in addition, and that in fact they must share 2638 and 2738 with the whole world. It suggests that more liberal Alaska rules for transmission be extended to the Washington area.

Gary Martens, chief laboratory technician for Northern Radio Co., Seattle, checks out a multiple-channel radiotelephone aboard the "Alaska Standard." This type of unit enables the tanker to contact canneries and fleets at various points and to maintain telephone contact over long distances.

● The FCC thus far refuses to do this and apparently the whole matter hinges on the factor of "type acceptance." What is "type acceptance"? It refers to the two technical characteristics of old radio sets, reliable though they may be otherwise, to drift or double into other frequencies used by other types of communication. An unapproved set puts out a "fat" signal that vibrates, for instance, at 2734 and 2742 just as much as at 2738. Furthermore, it produces an harmonic at double the vibrations, or 5476 kilocycles, or even higher. The problem extends into communications in the aircraft industry particularly, as well as to loggers, taxicabs, police and other fields of radio use. Apparently the use of new channels becomes feasible as soon as all radio transmitters in use are standardized with "type-accepted" quality. When every set transmits on a finely-adjusted frequency of little variance or "close-tolerance," and with no harmonics, then we shall find open areas in between for new frequency use.

In the meantime, more and more vessels are using transmitters. Their cost has been cut in half in the past 18 months, as more manufacturers standardize small new type-accepted sets, with the result that even the outboard boating enthusiasts are joining the din on 2638 and 2738. The North Pacific Marine Radio Council reports in a recent petition to FCC: "At the present time it is believed that an approximate 70,000 boats in the North Pacific area are using these channels, and a chaos has resulted . . ."

What if the chaos is resolved with universal type accepted sets, and new channels are then allowed? Here the fisherman with a 5- to 7-channel set will face the need to buy a more versatile set. He'll find that many of the boats he works with will have 11 or more crystals and they won't read him on his limited set.

The radio problem will be solved, it is felt, and with it will come a new revolution in marine radio in the mid-1960's. The radiotelephone of the future, even for relatively small fishing vessels, will have 11 or more channels, perhaps over 20! This may be a dismal prospect to the fisherman with a new set now, but a comforting thought perhaps is that sets so large will probably come down in price as they, too, become standard.

Radio is still the fisherman's oldest friend in the electronics field, albeit a friend working with one hand tied behind his back. The problem is to untie that extra hand and make him the handy aid, for the future, that he has become in the 60-odd years since Marconi patented the first crystal sets.

Safety at sea must remain the first task of the wireless. The radiotelephone has probably saved more fishermen's lives than any other device of man's invention, and we must be sure that it can always do so. Nightfall, fog and storms will always come, and if the air is not free, the ether must be so.

Echo Fishing — and Chart Interpretation

By
R. G. HAINES
Cmdr., R.N. (Retd.)

• It is almost 25 years since the first recorded charts of fish echoes were obtained on a Hughes echo sounder in Norway by the marine biologist Oscar Sund. Since then the use of the echo sounder has become widespread in fishing industries all over the world. Within the last few years, underwater echo-ranging equipment for the detection of mid-water shoals has also been introduced as an aid to the fisherman, and these sets (usually known as "sonar" in America and "asdic" in Great Britain) are today being fitted in increasing numbers. Echo sounders, specially designed for fish detection, are used for finding fish, for determining the density of the shoals and their minimum depth and are also invaluable for indicating the nature of the seabed. Today there is in existence a vast accumulation of practical experience on results obtained with echo sounders used for fish detection. However, much of what has been published on the subject is not readily available to fishermen.

The Recorder

• Before considering echo traces of fish in detail, a few words about the recorder itself are necessary. Today two main types of recording are used. The Recorder Chart and the Cathode Ray Tube. These two ways of displaying the information obtained from the transducer are not mutually exclusive but complementary. They each have their advantages and disadvantages and they can be used in conjunction with each other. The Cathode Ray Tube (CRT) has the advantage of making possible an amplified display of a small layer of water, say about 5 fathoms, anywhere between the surface and the bottom, which is difficult to achieve on a Chart owing to the high pen speed that would be required. As against this the recorder has the great advantage of providing a "memory". It is also a fact, which has been proved experimentally, that a series of echoes obtained from successive transmissions appearing one above the other on the chart to form an "echo trace" are easier to observe than a single echo of the same amplitude. This is a feature of the chemical recorder which has perhaps a greater significance when used for echo-ranging (asdics) than for echo sounding. Two kinds of recording paper are available. Moist (potassium iodide) and dry ("teledeltos" or "timefax") paper are both in general use and most fishermen have already a preference for one or the other. Some of the more modern echo sounders are, in fact, designed to use either. They each have their advantages, but from the point of view of chart interpretation perhaps the most important consideration is the number of separate gradations between white and black that can be distinguished. This has been determined experimentally to be approximately 30 for dry paper and 50 for moist paper. The comparable figure for the C.R.T. scale expander is about 100.

The moving pen marks the chart at a distance from the lefthand (or upper) edge of the paper comparable to the depth of the target. If the pen is mounted on a rotating carriage a curved trace is produced, leading to some distortion of the profile of the seabed. However, it is worth remembering that the pen trace, whether straight or curved, always produces a distorted picture, the amount of distortion depending upon the speed of the ship, the speed of the paper and the depth scale in use. Here, perhaps, reliability is the most important criterion and as a rotating pen is the simplest possible mechanical arrangement, there is a case for preferring this to the type of recorder giving a straight line trace.

Figure 1
Examples of crescent-shaped echoes from single fish. The darker markings are from groups of fish. The broken line near the bottom trace indicates the upper limit of the C.R.T. display.

Echo Sounding

• The type of fish echo trace produced on the echo sounding chart depends primarily upon the characteristics of the ultrasonic sound beam produced by the transducer. This can be likened to the beam of light produced by a rather badly focused torch. As the distance to the target increases the area illuminated will also increase. At close ranges there may even be a ring of light round the main beam. So it

NOTE—Through this article where Commander Haines uses the word "shoals" he is referring to masses of fish, or "schools" as the term is in America.

NOTE—Commander Haines is Technical Officer of Kelvin and Hughes (Marine) Ltd., London, England.

is with echo sounding. The size of the area "illuminated" at the depth at which the fish or fish shoals occur will largely determine the appearance of the trace on the chart. A single fish will enter the area "illuminated" by the echo sounder beam shortly before the ship passes over it and will continue to be illuminated, that is, to return echoes, after the ship has passed. The depth recorded on the chart only represents the true depth of the target when the ship is exactly overhead, those recorded before and after this moment being greater than the true depth. The typical trace produced is in consequence of a crescent shape (examples can be seen in Figure 1). The lengths of the two arms of the crescent and the amount of curvature depend, not upon the fish itself, but upon the characteristics of the sound beam and the speed of the ship as it passes overhead; in fact a trace of this kind can be produced from any small object in the water, whether it is a fish or not. When a group of fish, or a small shoal, comes within the illuminated area all the crescent traces from each individual fish become merged to form a large blot on the chart. Clearly, the depth of the shoal is, in this case, indicated by the minimum depth recorded on the chart. When large or densely packed shoals of, for example, herring or pilchard are detected, the tail of the shoal trace becomes more diffused as the depth increases and can, in some cases, extend into the bottom

Figure 2
Photograph of C. R. T. scale expander showing fish echo just clear of the bottom.

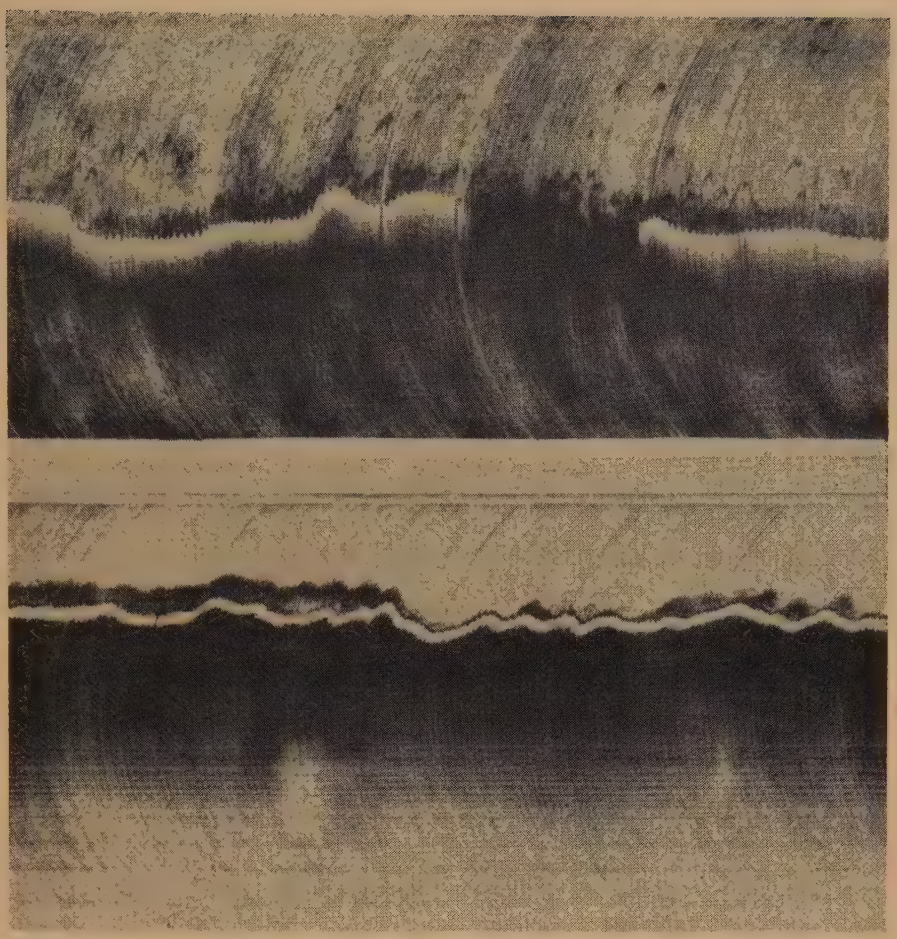

Figure 3
Separation of bottom-fish echoes by "White Line" amplifier. All the echoes above the white line are fish. The serrated effect is due to the pitching of the ship. In the upper chart the interruption of the "White Line" is the result of turning off that function for a short time. Note the confused trace of the fish with that of the bottom in this sector.

echo itself. The reason for this extended tail or "plume" is not fully understood and is usually not apparent when echo-ranging. It may be that some part of the sound beam is reflected back and forth between individual fish before finally returning to the ship. The "delayed" part of the beam would produce late echoes marking the chart at greater apparent depths, and giving the trace its characteristic "plume".

The strength of the echo returned depends, of course, upon the power of the echo sounder and the depth of the fish. It also depends upon the size of the fish itself. However, the outer surface of the fish is a poor reflector to the sound beam and it has been found that a large proportion of the echo is reflected by the swim bladder. Not all fish have swim bladders and this accounts for the fact that herring, pilchard, cod, haddock (all of which have swim bladders) are generally easier to detect than mackerel (which do not). Finally, it is worth mentioning that the reflection index of fish tends to improve as the frequency of the sound beam is raised. On the other hand, the rate of attenuation, or dissipation, of the sound beam in water also goes up with frequency. It is probable that these two conflicting factors roughly cancel each other out between frequencies of 30 to 50 kcs.

Bottom Fish

● The C.R.T. type of display is well suited to the detection of fish on or near the seabed. There are two reasons for this. By limiting the scope of the C.R.T. to cover only the few fathoms of water above the bottom, the picture can be expanded or magnified. Furthermore, the fish echoes are clearly differentiated from those from the bottom itself. The stronger bottom echo deflects the spot further from the center-line, and so causes it to move faster, leaving a fainter trace; in consequence, the fish echo, immediately above it, is the more easily distinguished. Fig. 2 illustrates this point. But, unlike the recorder, the C.R.T. provides no permanent or cumulative record. However, a new development, first introduced by the well-known British marine instrument

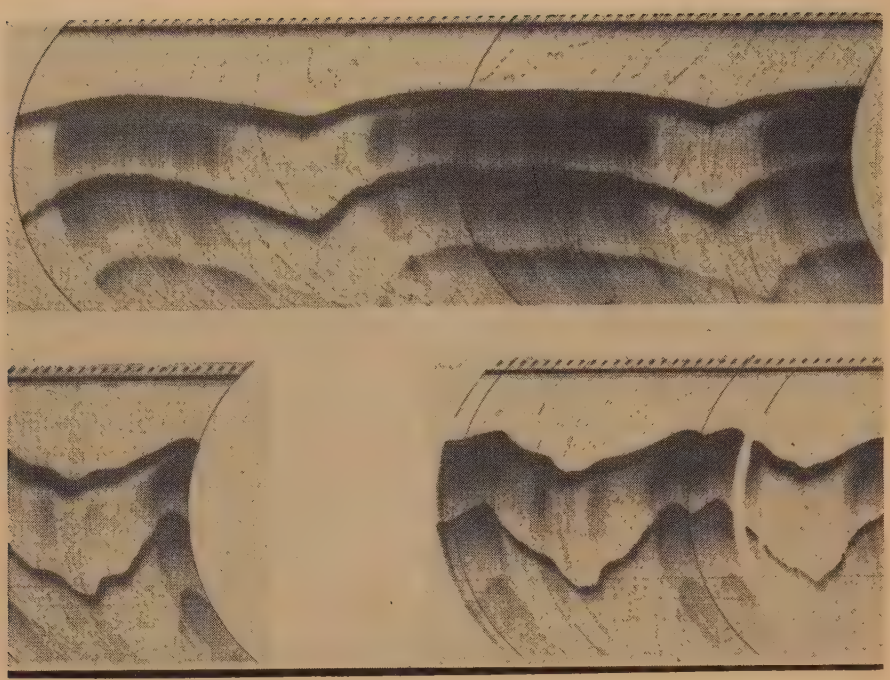

Figure 4
Examples of bottom discrimination. The extended tail on the bottom echo indicates a hard, or rocky, bottom.

manufacturers, Messrs. Kelvin & Hughes of London, has greatly improved the chart record for bottom fish detection. This is known as the "White Line" amplifier, and its purpose is to separate fish echoes from the bottom echo itself. This is achieved by causing the amplifier to stop functioning altogether for a limited period in response to echoes above a certain amplitude. The operating level of the circuit is set to cut out the amplifier on receipt of the bottom echo only. The weaker fish echoes are amplified in the ordinary way. Thus the bottom profile appears on the chart as a white line and the fish echoes stand out clearly above it. Actual recordings reproduced in Figure 3 show how extremely effective this device can be.

Recognition of Species

● From the foregoing remarks it will be clear that the appearance of the echo-trace recorded on the chart or C.R.T. depends on a number of other factors as well as the actual characteristics of the fish itself. However, the species of fish detected can sometimes be inferred from the appearance of the echo traces, when this is coupled with a knowledge of the habits of the fish being searched for.

Bottom Discrimination

● The echo sounder is also widely used for indicating the nature of the bottom, information of the greatest importance to fishermen using a Danish seine or bottom trawl. A hard or rocky bottom being a better reflector of sound than a soft or muddy bottom, echoes from the former will extend over a greater distance on the chart than those from the latter. This is because the sound beam "illuminates" a larger area of the type of bottom which gives a good reflection. The distances from the transducer to the outer edges of this area are greater than the vertical depth, and so echoes received from them take longer to return to the ship and thus extend the bottom echo. Transducers have been specially designed to give improved "ground discrimination". (Kelvin Hughes fishing echo sounders MS28, 29 and 30 can be supplied with "G.D." transducers.) Examples of the difference between hard and soft bottom echoes are given in Figure 4.

Echo Ranging

● By directing the sound beam in the horizontal plane, instead of vertically downwards, a much larger volume of water can be examined for the presence of fish. Instruments designed for this purpose have been introduced during the last few years and are becoming more and more widely used for mid-water fishing. The information obtained in this way is displayed on the same type of recorder as that used for echo sounding. The scale across the chart now indicates range, and not depth; and because the bearing of the transducer is not permanently recorded, the echo ranging chart, when examined subsequently, does not give the whole picture. This makes the chart rather difficult to understand at first. Once a shoal has been detected while searching from beam to beam of the vessel, the search is interrupted and the transducer is held on the bearing of the shoal. In the meantime, the ship's course is altered towards the bearing and the range is reduced in order to have a closer look at the shoal to determine whether it is of a suitable size and at the right depth for catching. The echo trace produced is, therefore, drawn diagonally towards the leading edge of the chart as the range decreases. Examples of echo-ranging traces of herring shoals obtained by the Kelvin Hughes "Fisher-

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Figure 5 (a)
Typical horizontal echo trace of a herring shoal. (Scale 0-100 yards). In the upper half of the chart the set has been switched to echo sounding.

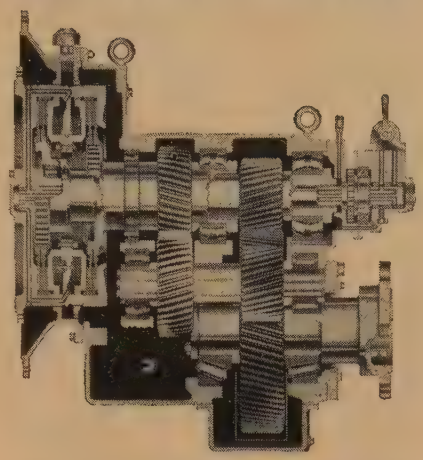
man's Asdic" are shown in Figure 5. It will be noticed that, unlike the echo sounder traces of mid-water shoals, the echo obtained from the horizontal direction is not followed by a tail or "plume". The width of the horizontal echo does, in fact, give quite a good indication of the size of the shoal. Another indication of its size can be obtained by noting the number of degrees of bearing over which the echo is picked up.

In the first example shown, the asdic—a combined echo-ranging and echo-sounding equipment — was switched to vertical transmissions just before the ship reached the shoal and the echo sounder profile obtained as the ship passed overhead.

With experience, echoes received from rocks, wrecks and other objects on the bottom, and from wakes of other vessels, can be distinguished almost immediately and disregarded. Good echoes have been obtained from mid-water shoaling fish such as herrings and pilchards and also from tunny fish. The asdic principle has also been used successfully for holding contact with whales and so aiding the problem of tracking them during the approach to harpoon firing range.

Figure 5 (b)
Horizontal echo trace of a herring shoal (Scale 0- 1500 yards). The spots on this chart are interference from an echo sounder being used simultaneously.

It's how and what's inside



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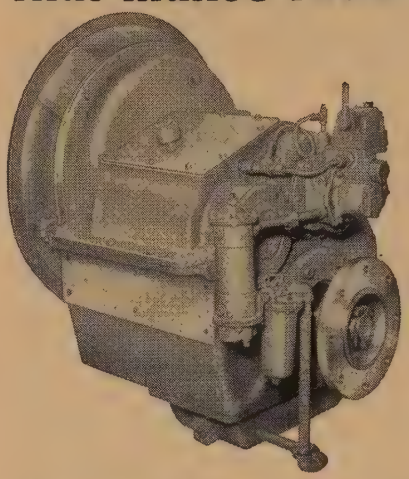

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● Use of light in the attraction of fish may be challenged on the ground that lights are not properly electronic, and the subject should be excluded from discussion in this review of "Electronics in Fishing."

Refuge is taken, however, in the loose definition of what is proper for discussion here, and the inclusion in subject matter suitable for this issue of modern application of physical phenomena to fishing.

Attraction of fish by means of light goes back to the beginning of art of taking fish, and perhaps represents Man's first conscious employment of an attractant for fish beyond the use of bait.

Whether it was a torch in the spearman's hand as he waded in the shallows; or bonfire on the beach to draw the fish and hold them while the seine was set about them; or the cresset fixed in the bow of the early fishing vessel, light has served fishermen from beyond the daybreak of history upon the sea.

Today industrial fishing around the world finds lights valuable to lure some species of fish into Man's means of capture. While the Mediterranean and Iberian fisheries largely make use of lights, the Japanese probably employ light for attracting fish to a larger degree, and in the making of larger catches, than any other fishermen of the world.

● Japan uses attractant lights in many fields of fishing; but none more importantly than in the lift or blanket nets with which saury and jack mackerel are fished. Here batteries of strong lights gather the fish to the night sea on one side of the vessel, while the net is prepared on the opposite side. Then the lights are switched off above the great school of fish, and switched *on* above the net on the opposite side. The fish rush under the vessel to the new light, and into the net.

With certain species this is a highly productive method, whose capacity of course depends upon the efficiency of the light as an attractant. The more fish, and the more frequently that they can be gathered, the better the yield of the nets.

So the Japanese have set about determining scientifically, first, what kind of light best attracts fish; second, how to provide such light under actual, practical fishing conditions.

● Findings on the first point are reported by Dr. N. Y. Kawamoto of the Faculty of Fisheries, Mie Prefectural University, who has conducted much of the research on the quality of light for fish attraction.

He determined that many species were specially attracted by blue and green lights, and that "Spectral luminosity" played an important part in deciding which type of light in these colors is the more efficient. He found also that lights could be used on moonlight nights, provided the intensity of the light is of sufficiently high level in comparison to the moonlight.

He reported also that wave lengths of more than 750 mu. are beyond the limit of susceptibility of fish.

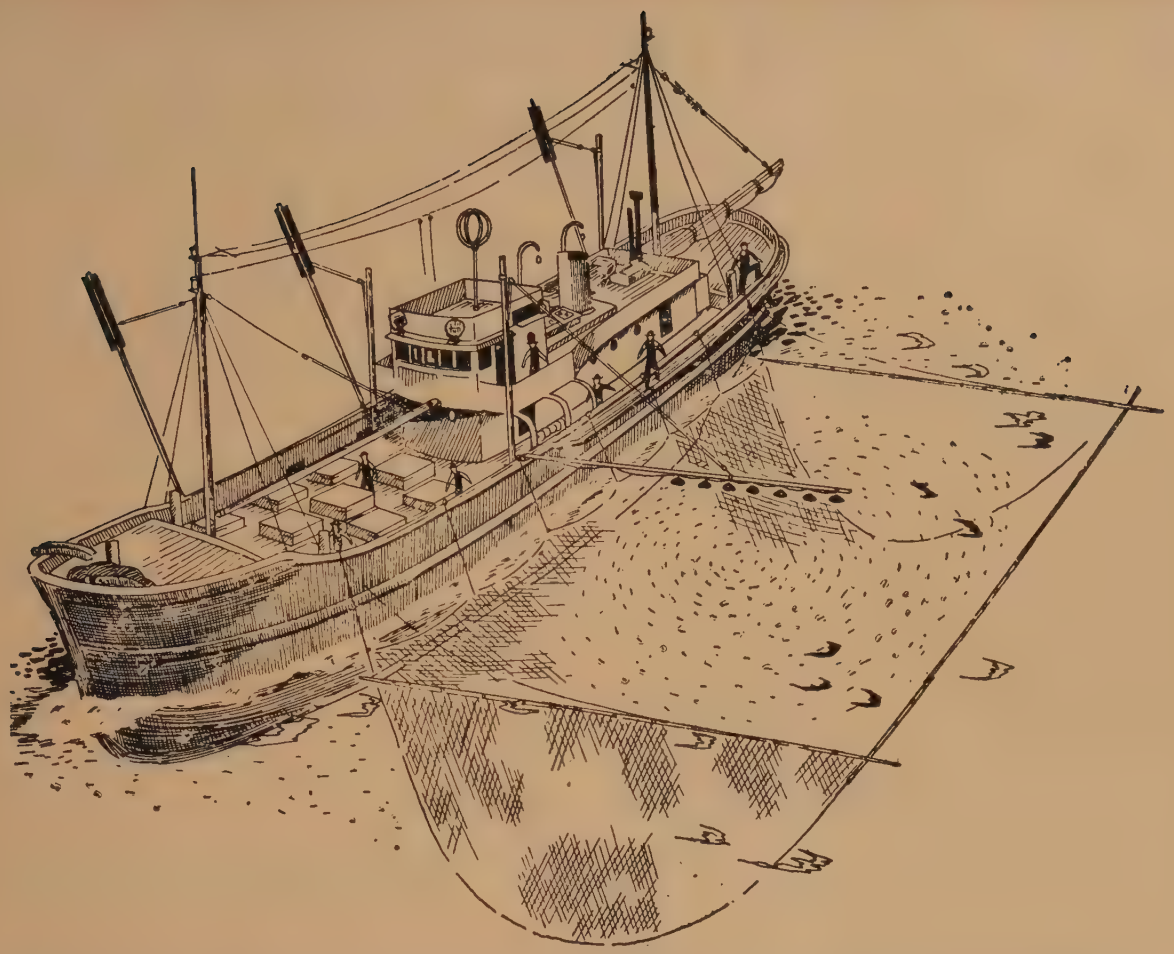
● With these scientific facts in hand, indicating the special effectiveness of mercury vapor lamps in attracting fish, the Sanden Company of Tokyo undertook the manufacture of mercury vapor lights for fishing. This required, as a practical thing, the overcoming of the problem of current.

Prior to the development of the new Sanden mercury fishing lamp in 1958, mercury lamps available for fishing required alternating current, which obviously is not often available aboard fishing vessels of the size and kind used for fishing with lights.

In 1958 the company perfected and brought onto the market not only an entirely successful direct current mercury lamp for fishing purposes, but also a lamp performing to full efficiency with *either* d.c. or a.c.

Efficiency of these lamps was tested in practical operation by the Tokai Regional Fisheries Research Laboratory of the Japanese Fisheries Agency, which found they were particularly effective in attracting sardines, mackerel of several species, salmon, trout (a term often used by the Japanese to designate Pink salmon), and squid.

Character of the light emitted by the direct current mercury lamps made



Light Fishing is conducted by craft such as this in Japan. The three black objects on inclined poles on the far side of the vessel are reflectors for batteries of powerful lights. These are lowered close to the water and lighted while the net is being set on the darkened side of the vessel. Then the starboard lights are extinguished and raised, and the lights above the net turned on. The schooled fish rush under the boat to the new area of illumination, when the inboard edge of the net is raised, reducing the fish to capture.

by the Sanden Company is said to be particularly effective in attracting fish, as the moderate ultra-violet rays from the lamp appear superior as attractants to the stronger rays of ordinary mercury lamps.

The Sanden lamps are available in 24 and 100 v., d.c., and in 100 v., a.c. Wattage of most models is 500, but two are available in 250 w. They are made of a special glass which resists cracking under stress of thermal shock from rain or seawater while hot. Brightness for current consumed is three times that of incandescent lamps, and useful life is six to 10 times longer, being rated at 5,000 to 6,000 hours of service.

Spectrum studies of the Sanden lamp shows its light falls in the short wave-length band between 320 and 360 mu., which is most effective in attracting fish. Moreover, this blue light, largely ultra-violet, has the ability to penetrate seawater deeply.

At time of writing it appears that The Sanden lamp, reported to be the only d.c. mercury lamp available in any country, may make significant contributions to the productivity of fishing based on the attractive power of light—and particularly that in the short wave length u.v. band.

Laboratory Tests Electronics As Tools in Fish Management

● Recognition by scientists as well as fishermen of the remarkable opportunities afforded by electronic phenomena and instruments based upon them for solution of problems arising from fish and fishing led early this year to the establishment at Seattle of a Fisheries Instrumentation Laboratory.

This Instrumentation Laboratory is a component of the United States Bureau of Commercial Fisheries' Seattle Biological Laboratory, under the general supervision of Clinton E. Atkinson, director.

The Fisheries Instrumentation Laboratory itself is headed by Richard H. van Haagen, supervisory electronic scientist, supported by Richard C. Othberg, Harry P. Dale, Warren Odegard, Gordon E. Esterberg, Donald L. Thorne, Karl A. Hampton and Chester O. Wheeler.

While the problems undertaken by the Instrumentation Laboratory, or FIL, as it is casually known in the Bureau of Commercial Fisheries, primarily are connected with scientific research, biology, and means of speeding work and increasing the accuracy of studies, many of its investigations may prove to have aspects of commercial value, to the fisherman and to the manufacturer of the electronic instruments he has come to employ so generally.

Thus the principles studied with respect to guidance of fish, whether positively into safe channels, or negatively out of dangerous ways, may come eventually to be applied to electro-fishing and the guidance of fish into equipment for capture.

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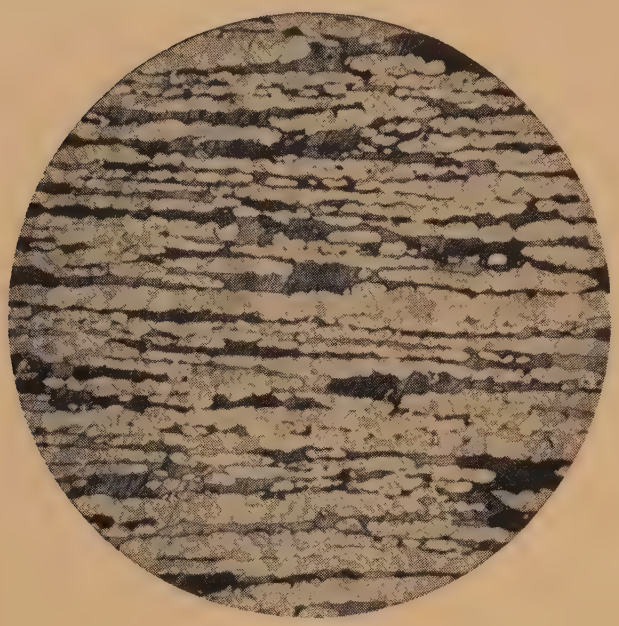

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Electrical Conductor Trawl Cable

Bears Rich Potential for Fishing With Instruments

● Potential for employment of electronic equipment in fishing increases sharply with successful tests of a steel trawl cable carrying electrical conductors. This cable, manufactured by the American Steel & Wire Division of the United States Steel Corporation, was employed by the U. S. Bureau of Commercial Fisheries' exploratory fishing vessel *John N. Cobb,* making possible electronic and electrical observations of the trawl gear's performance.

The cable currently is being employed on an experimental basis only, although Columbia-Geneva Steel Division of the United States Steel Corporation is in position to furnish it on special order.

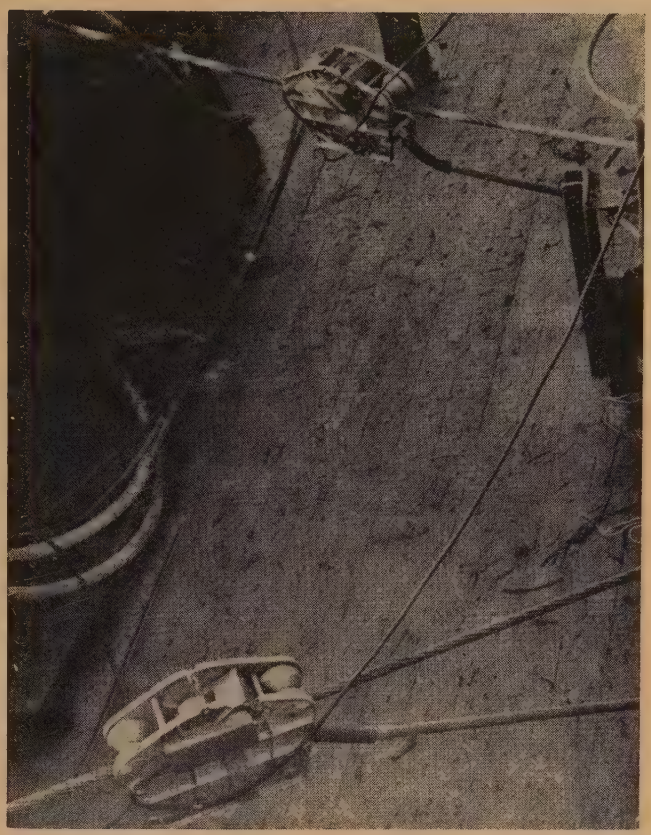
The conductor cable, which is known as an Amergraph type cable by its manufacturer, is especially adapted to trawling need from cable originally developed for other electromechanical installations. It consists of of a normal steel trawl warp, 9/16" diameter, with a center of six specially insulated ultra-flexible type copper conductors, and has a breaking strength of nine tons.

The Amergraph cable is employed as one of the trawler's warps. On the *John N. Cobb* the 3,000' cable is made up of two sections.

According to Richard L. McNeely, electronic scientist, U. S. Bureau of Commercial Fisheries North Pacific Fisheries Exploration and Gear Research Division, splicing the electrical trawl cable is much more difficult and time-consuming than splicing standard cable used on fishing vessels. Although a 50' splice is required, it proved not too difficult with experience, two workmen making a splice in two days working time.

Present cost of the electrical trawl cable is somewhat higher than that of the regular plow steel trawl cable, but this cost differential cannot be properly evaluated until the life of the electrical cable can be determined through actual service over a period of time.

Mr. McNeely reports some breaking of the electrical conductors in the core of the cable was experienced in early trials. This was found to result from stresses created in running the electrical cable over the sheaves of the standard 9" diameter trawl blocks. After some study special 20" diameter aluminum blocks were employed with full conductor protection.



Trawl Cable Meters on a big trawler's warps, counting and reporting the exact length of each cable. Note that these two meters are fitted with electric wires, permitting their data to be presented to the trawl winch operator at his station; and to the vessel's master on the bridge, if desired.

Practical Advantages Derived From Electrical Cable

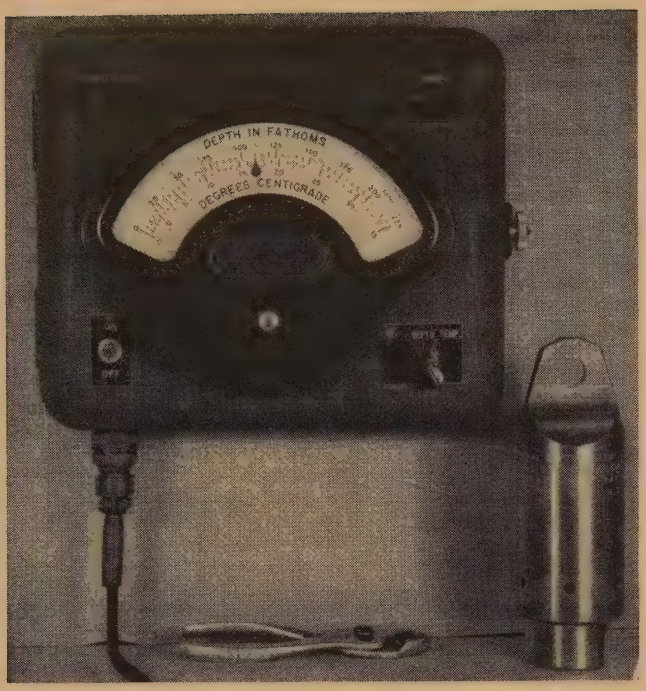
● A number of advantages are visualized as possible for application of electronic equipment to industrial fishing as result of development of the electrical cable.

These devices—some of which are electric rather than electronic in character—are variously of industrial and research character. The list includes:

On-Bottom Indicator, which is a comparatively simple spring-loaded switch on the bottom of the trawl door, which is closed by pressure of the door on the sea bottom. When the doors are functioning properly a light burns in the pilot house. If the trawling speed is too fast, or currents are encountered which affect the function of the gear, so that in either case it tends to rise off the bottom, the light in the pilot house goes out. This device, which becomes possible of application through the electrical cable, is believed by D. L. Alverson, chief, U. S. North Pacific Fisheries Exploration and Gear Research Division, to carry promise of real benefit to trawlers. This is only one of the electrical fishing gear devices which will be developed to attach to the special cable making it possible for a vessel to use the cable to its capacity in monitoring and telemetering information from the ocean floor. This information can be transmitted to one observer or several at various stations.

Ground Speed Indicator, based on a speedometer-like device, could report the actual rate of movement of the trawl over the ground without reference to wind, current or propeller rpm. This would permit more precise adherence to bottom contours and a fishing course than is possible on the basis of time/rpm. or even echo sounding.

Thermometric Fishing may become practical with experience. This method is based upon observations that fish concentrations may be governed by relatively minor temperature variations. As water temperatures affecting concentrations of trawl fish become known it should be a relatively simple matter for the fisherman to be supplied with precise information as to the bottom temperature at which his gear is fishing through data trans-



Depth Telemeter operation on trawls fished by the research vessel **John N. Cobb** depend upon these two units, linked of course by an Amergraph electrical conductor cable serving as one of the vessel's two trawl warps. The depth and temperature are sensed by the unit at the right and transmitted to the instrument shown for presentation.

mitted by the electrical trawl cable.

Attraction by Light under water is practiced in numerous fisheries throughout the world, and appears to be one of the promising avenues for increasingly effective fishing. Although not well demonstrated so far as trawling is concerned, there remains the very good possibility that proper lights and wave lengths may be developed to attract fish into the paths of trawls. Lights on the head or foot rope could be readily provided with current through the electrical trawl cable.

Monitoring the Catch in a trawl is possible through means of a mechanical dynamometer on the trawl cables, but this method is subject to considerable error as result of speed of vessel, depth of water. A device to report changes in the strain between the trawl and the doors would provide much closer information, which could be communicated to the skipper through an electrical trawl cable.

Depth Telemeter becomes a vital factor for fishing with a mid-water trawl, where knowledge of the exact depth at which the net is fishing is necessary if it is to be run in water where fish have been indicated by echo sounder or ranger. While there are a number of devices used to give this information, those based on accoustic principles may be affected seriously by distance, current, wake and ambient sea noises.

Methods of determining trawl depth in mid-water by means of the warp angle/length are subject to serious shortcomings from effect of currents, wind, tide, on the wire angle at varying towing speeds and warp lengths.

The depth telemeters currently in use out of Seattle operate to 225 fathoms depth, and were built according to the Bureau of Commercial Fisheries plans by the Olympic Instrument Laboratories, Vashon, Wash. Pressure potentiometers for telemeters of greater or lesser capacity are readily available.

● *Underwater Television* is a tool for the scientist and conservation researcher rather than the industrial fisherman, at least in any aspect of application which can now be visualized. Its actual employment in research, however, has been made possible through the use of the special electro-mechanical cable here discussed. In scientific work thus far the television camera has been limited in its results to areas of very clear water. Currently it is visualized as a means for studying the behavior of fish in the cod ends of trawls, the shape of meshes during actual fishing, and the ability of undersized fish to escape through meshes of different sizes.

● Olympic Instrument Laboratories, which as a custom manufacturer builds operating models of these devices, has just introduced a remote indicating counter for its Olympic trawl cable meter, Model 750.

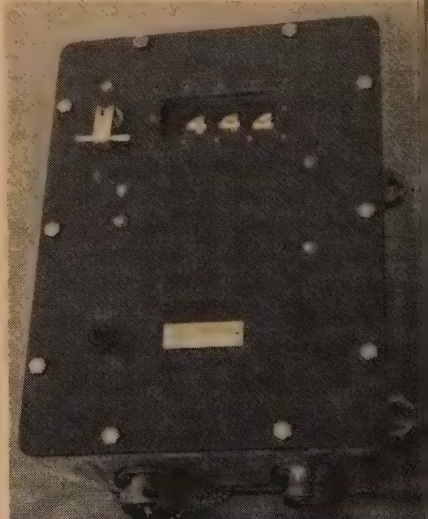
With the growth of mid-water trawling and the importance of keeping the trawl warps balanced, this firm developed this Model 750 trawl cable meter to accommodate trawl cable from ½" to 1" in diameter with markers and split splices. It was first shown at the International World Fishing Gear Congress in Hamburg, Germany, in 1957, after undergoing extensive testing by research organizations. Since then it has been purchased for medium-sized commercial and research draggers in the United States, Canada, France, United Kingdom South Africa, Pakistan and othe countries.

Service tests indicated that on larg trawlers it was not practical to locat the meters within easy reading dis tance of the winch operators. T remedy this, and also to permit a taching the meters in the most favo able location on the trawl warps electrical remote indicating conter were developed. This equipment oper ates on the ship's electrical power The counters are waterproof and hav ¾" tall figures which are illuminate for night service. If desirable, tw counters can be operated from eac meter, thus permitting the winch oper ator and an observer in another par of the vessel both to have accurat knowledge of the trawl setting.

An adaptation of the Remote Indi cating Counter for non-fishing appli cations such as large dredges, winche on research vessels and other commer cial operations is also proving success ful.

Electrical trawl cable makes practi cable the use of a depth telemete developed at the Seattle laboratory o the U. S. Bureau of Commercial Fish eries by Mr. McNeeley, electroni scientist. As he describes it:

"The system transmits continuou depth information from the mid-wate trawl gear to the pilot house of th vessel. A small pressure-sensing uni located on one end of the trawl cabl at one trawl door actuates a pilot house-mounted milliammeter which i calibrated to read depth in both fee and fathoms. . . . The captain refer to the meter and adjusts the length o the towing cable or speed of the vesse to raise or lower the trawl to th desired depth."



Remote indicating counter devel oped for use with Olympic traw cable meters to assist winch opera tor.

Species Identification Promoted by "Fischlupe"

Capt. Chas. Stiansen flashes a smile as bright as the CRT display on his Fischlupe, whose successful fishing is largely responsible for the smile.

• Actual *species* identification in schools detected by echo-sounding is often possible, particularly when equipment of the "Fischlupe" character is employed to magnify the sector in which the school appears, and thus permit closer examination of its character, the behavior and schooling characteristics of the fish composing it.

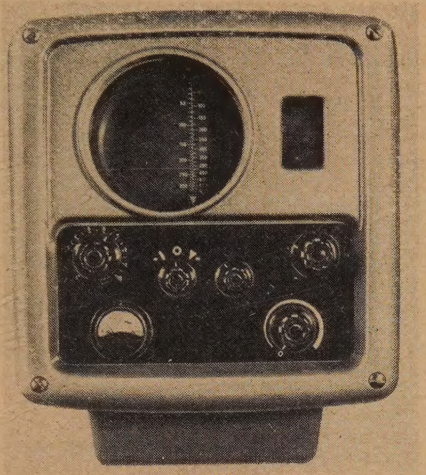
It would not be realistic, however, to contend that such identification can be done by electronic means, or on first use. Interpretation of the cathode magnification to determine the species necessarily must rest upon the fisherman's experience, the intelligence with which he analyses the evidence, and the faithfulness with which over a period of months he has observed the testimony of the trawl in the catch it brings aboard after the "Fischlupe" has shown the enlarged picture on the tube.

A few months of intelligent use, hand in hand with equally intelligent observation of results, enables a smart fisherman to identify with a fair degree of certainty the fish below his keel by the magnification in his "Fischlupe."

This on the testimony of Capt. Charles Stiansen of the dragger *Priscilla Ann,* who has been using an RCA LAZ-16 Fischlupe productively. So productive has it proved in fact, that he reports his vessel has more than doubled her catches, and that in fewer hours of fishing.

He uses his equipment in the double role of sounder and also of lupe, switching from one to the other when navigating or fishing; and when the sounder shows fish below at which he wants to take a closer look on the lupe.

Following his success with the "Fischlupe" aboard the *Priscilla Ann,*



"Fish Finder" or "Fischlupe," as it is frequently known to fishermen, in this LAZ-16 model is the type with which Capt. Charles Stiansen identifies species for his dragger **Priscilla Ann.**

his brother, Captain Stian Stiansen, installed one on his *Pauline Bertha,* remarking: "Our only regret is that we didn't do it sooner, for it has paid for itself many times over in fish caught and gear saved."

While the RCA LAZ-16 Fischlupe can be operated as a sounder as well as for sector selection and magnification, it often is installed in combination with an RCA Echograph to provide a chart record of the bottom, fish occurrences, obstructions, and the direction of travel, size and density, as well as depth, of the schools.

In addition to the standard Fischlupe, RCA offers a specialized "Shrimplupe," designed to work to a depth of 68 fathoms, against 328 fathoms for the standard unit; and to sound at the rate of 300 impulses per minute instead of 60. This model provides service specially adapted to the needs of shrimpers working shallow water, its variable range function permitting magnification of any segment of 2.8 fathoms from the surface to 68 fathoms. This provides magnification up to 40 times for any particular object marked.

The "Fischlupe" model operated independently has a magnification segment of 8 fathoms at any portion of the range from the surface. Where this equipment is synchronized with the RCA Echograph for record the magnification segment becomes 10.5 fathoms and is available below 8 fathoms, and from there to the full range of 328 fathoms. These units magnify to 42 times.

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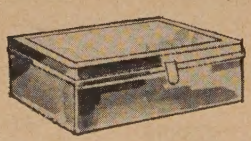

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American Can Co. 9
American Marine Paint Co. 26
Asahi Dow Limited 48
American Steel & Wire Division, U. S. Steel Corp. 14, 15
Baker Engineering Corporation 50
Bendix-Pacific 50
Bryant's Marina 36
Carruthers Co., E. H. 8
Caterpillar Tractor Co. ... 10
Classified 38
Columbia River Packers Assn., Inc. 6
Columbia-Geneva Steel Division, U. S. Steel Corporation 14, 15
Columbian Rope Co. .....Inside front cover
Consolidated Net & Twine 38
D'Acquisto & Sons 38
Devoe & Raynolds Co., Inc. 36
duPont de Nemours & Co., Inc., E. I. 17
Ederer Netting 45
Evinrude Division, Outboard Marine Corporation 43
Fremont Electric Co. 37
Frohman & Sons, L. H. ... 64
Furuno Electric Co., Ltd. .. 43
General Petroleum Corporation 32
Hart & Burns 36
Hatch & Kirk, Inc. 38
Hiller, Paul W. 50
International Paint Co. (Calif.) Inc. 47
Kaar Engineering Corporation 33
Kelley-Clarke Co. 8
Linen Thread Co., The ... 45
Marine Construction & Design Co. 37
Michigan Wheel Co. 52
Momoi Company, Inc. 34
Murphy Diesel Co. 30
Mustad & Son, O. 52
NC Marine 38
New England Fish Co. ... 7
Nordby Supply Co. 33
Northern Radio Company. 37
Oceanic Sales Co. 6
Pacific Fishing & Trading Co. 38
Pacific Marine Supply ... 40
Pacific Telephone & Telegraph Co. 52
Pacific Towboat & Salvage Co. 38
Peelers Company, The ... 7
Roebling's Sons Corporation, John A. ... 60
Sanden Company, Ltd. ... 58
San Juan Fishing & Packing Co. 7
Seattle Boiler Works 37
Sesco, Inc. 43
Shepherd Marine 64
Shepherd Son & Co., J. H. 64
Snow-Nabstedt Gear Corporation 57
Sperry Piedmont Company, Division of Sperry Rand Corp. 45, 47
Standard Oil Company of California 29
Standard Steel Corporation 6
Starr Net Co., A. M. 38
Stern Can Co. 63
Stix, Inc., Robert L. 6
Tacoma Boat Building Co. 38
Texaco, Inc. .....Back cover
Toyo Rayon Company ..... 48, Inside back cover
United States Steel Corp. 14, 15
Viking Equipment Co. ... 56
Vita Food Products, Inc... 63
Wendt, Ivar 6
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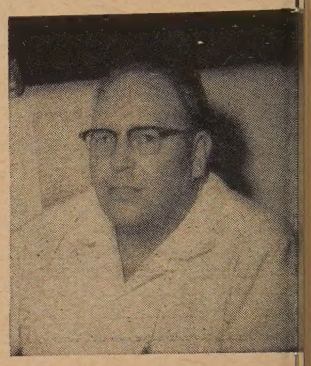

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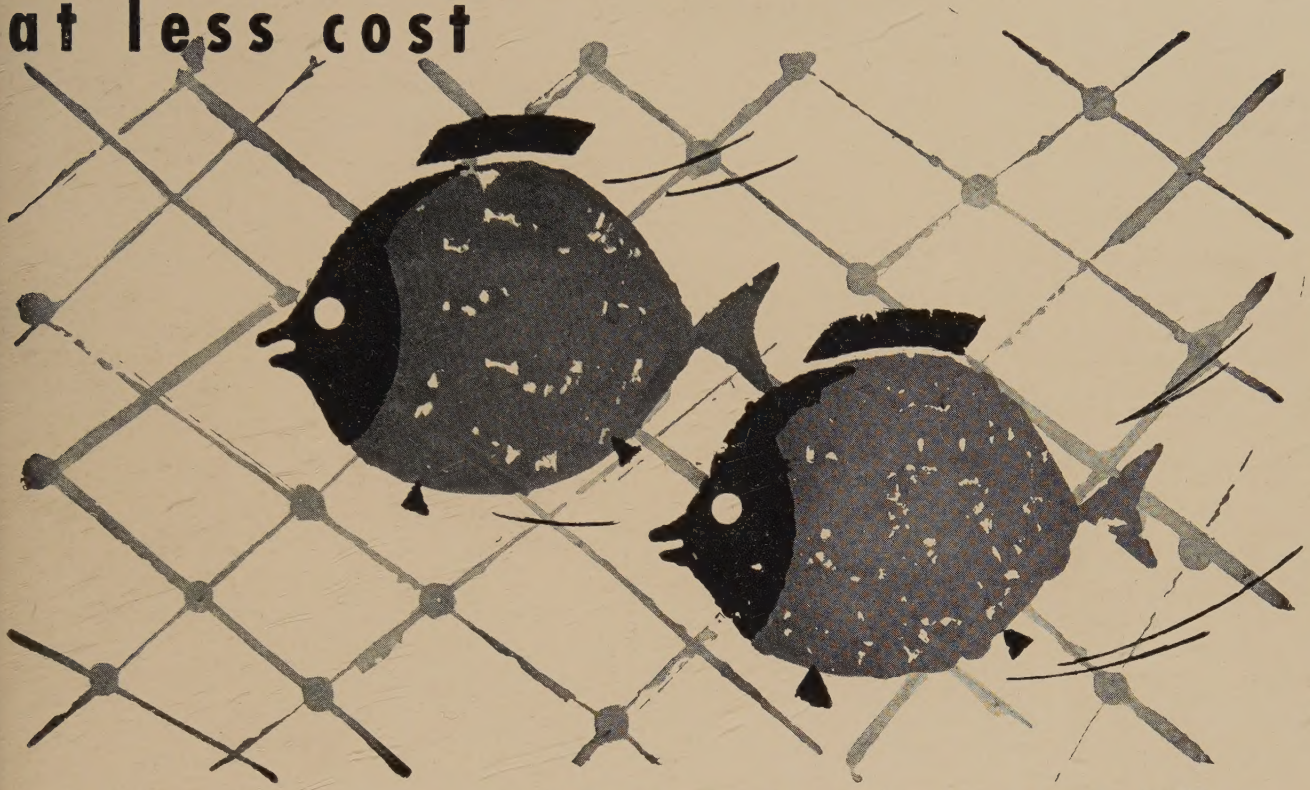

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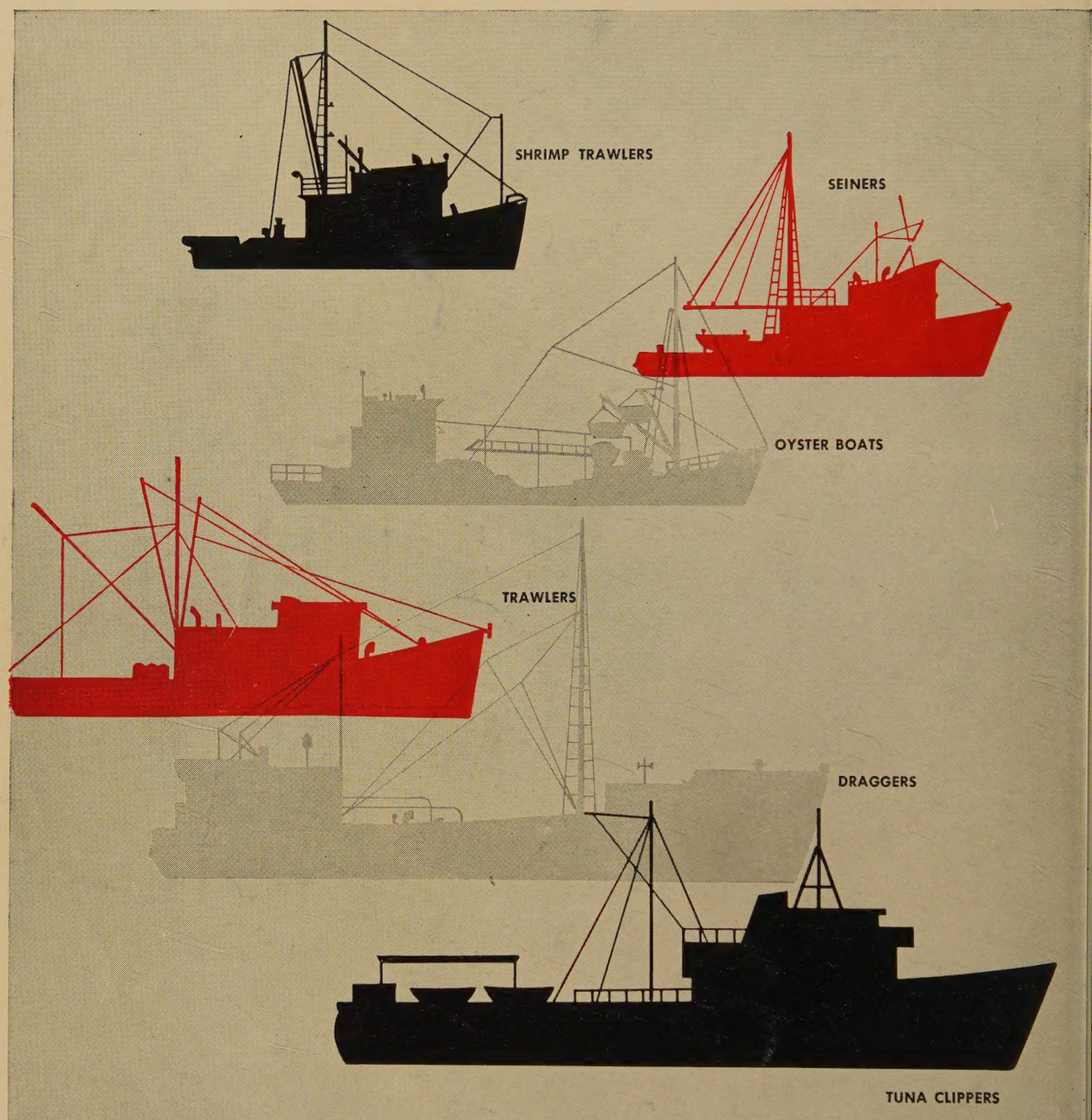

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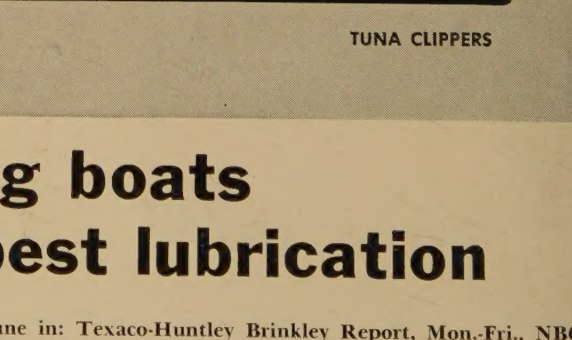

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